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IQP Teaching Practicum: Mathematics - Cecily Coia

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A Teaching Practicum in Secondary Education: Mathematics

An Interdisciplinary Quality Project
Submitted to the faculty of
Worcester Polytechnic Institute
In partial fulfillment of the requirements
for the Degree of Bachelor of Science

Submitted by: Cecily Coia

Submitted to: Professor John Goulet

Date: March 6th

Dedication

I would like to dedicate this whole paper and my entire experience to Renah Razzaq, without her I don't know if I could have survived. Thank you for picking me up when I was down and making me want to come to school everyday! Lastly thank you for being such an inspirational teacher and loving what you do so much, I have never met someone who gets so excited about a great lesson plan like you do!
Thank you for being you!

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Abstract

Throughout this paper it discusses my experience of student teaching at Doherty Memorial High School in the fall of 2014. This practicum fulfills the requirements of Worcester Polytechnic Institutes Interactive Qualifying Project as well as the Massachusetts Department of Educations teaching requirements.

This paper describes how I met the five Professional Standard of teaching. This follows with as account of my Worcester Polytechnic Institute education and describes the classes I taught while teaching at Doherty.

Chapter 1 - PQP

Overall student teaching/ observing has been an interesting experience! For starters, I went to an all-girls school in Providence, RI and I am used to everyone being on their best behavior as well as being very intelligent! Not to say that is not the case at Doherty but there are a few differences.

To begin discussing how Doherty Memorial has become who they are today I think they owe a lot to the Massachusetts Education Reform Act of 1993. This act really helped the emphasis of equity along with setting some standards that students must meet before graduation. The world is all about expanding and making this earth we live on a better place and what better way to do so than to make sure your youth is educated properly. The progression of technology we have seen over the years has grown exponentially and it appears there is no limit to what we can do to progress. This act was definitely the start of something great.

The Massachusetts Education Reform act also put into place the idea of standardized tests also know as MCAS (Massachusetts Comprehensive Assessment System). I can see pros and cons to having standardized testing across the state. The first pro being that this is a form of promoting equity amongst students because your scores represent your school so teachers want everyone to succeed, not just the naturally gifted students. Another plus to this is to make sure students across the state are learning the same concepts; it gives teachers a guideline to how they should focus their lesson plans.

On the other hand, as a con of MCAS testing, I found however that some teachers feel the stress of trying to cover every specific topic before the MCAS exam

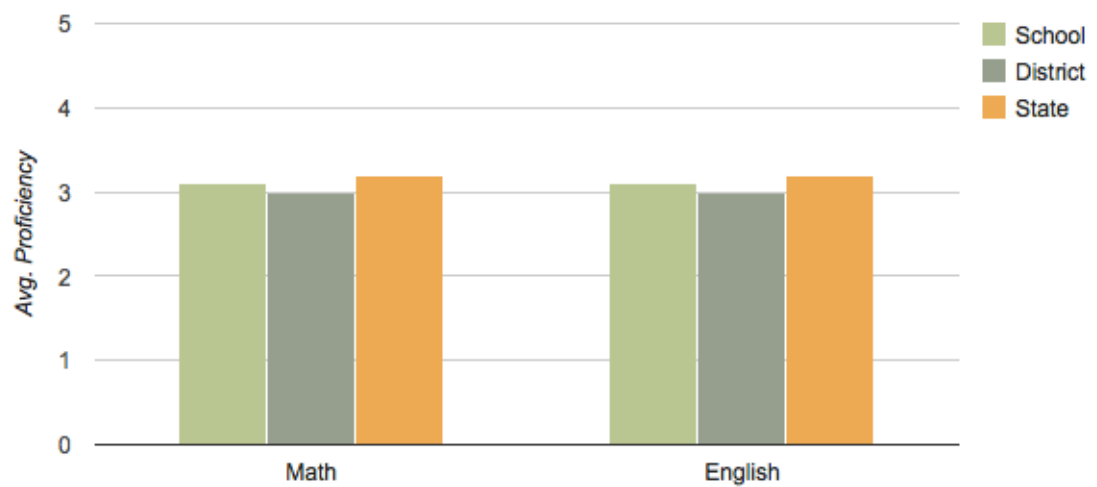
forcing their lessons to be less efficient because sometimes they are on a tight timeline. Another con I could see would be that I wouldn't necessarily say it is fair to judge everyone based on one single test due to the fact some people just don't do well testing. I have learned after introducing a project to my Pre-Calculus class that 41 out of 52 students prefer project-based assessments to a test according to a survey I conducted afterwards. Though we could go back and forth on MCAS testing I think this could be something to set Massachusetts apart from the rest of the United States.

In terms of international community and math performance, Massachusetts is rated very well. According to TIMSS (Trends in International Mathematics and Science Study), "Among the U.S. states that participated in TIMSS at grade 8, Massachusetts, Minnesota, North Carolina, and Indiana scored both above the TIMSS scale average and the U.S. national average in mathematics." When doing future research I found that Minnesota also has a statewide math test called the MCA (Grades 3-8) and the MTAS (Grade 10). Also I found not so surprising that North Carolina and Indianan have a similar statewide testing setups as well. Perhaps there is a trend here!

In Worcester itself there are a total of 7 high schools throughout the city. According to MCAS scores in math in the year 2013 Doherty memorial rates 3rd out of all 7 school in Worcester. At number one we have Worcester Technical High and in second we have University Park Campus School. When I broke it down a little more it appears Doherty has the highest percent of advanced students at 52% and for proficient they rank last with only 19 percent. Although proficient is the highest

category to strive for I see Doherty as one of the leading schools representing equality for the simple fact that over half of their school rates above average on their MCAS scores.

In comparison to the state of Massachusetts as well as the District of Worcester we can see below that Doherty ranks much closer to the state than that of the district in terms of Average Proficiency in not only math but also English.



At Doherty there is an enrollment of approximately 1,331 students with 92 Full-Time teachers, this leaving the student to teacher ratio at about 15 to 1. In terms of ethnicity and race of the total amount of student enrolled at Doherty, 54% are of a Minority with only 46% of White Ethnicity. The Hispanic Enrollment takes up 27% of the 54% minority as well as 14% of the Black student Enrollment. In terms of Disadvantaged students that are eligible for free or reduced-price lunch there's an astonishing 56% of students that qualify for this; 49% for entirely free lunch and 7% for reduced-price lunch. These numbers appear extremely high compared to what I am used to but Doherty accommodated everyone the best they can.

Chapter 2 – Planning Curriculum and Instruction

Planning the curriculum is very straightforward at Doherty memorial high school for most classes. In the math department it appears all the focus is on attaining good scores on the MCAS exam. There is such a range of students that vary from being forced to go to school to being high achievers and having high hopes of going to a great college. It is the teacher's job to try and make all the students succeed.

For my Honors Algebra II class I always found the curriculum extremely straightforward with a purpose. I always knew what was coming next. In the math department they break up the curriculum by quarters with the intention of finishing those chapters within that quarter with some optional chapters as well. I would say the only flaw with teaching algebra two would be the fact that we did system for many, many weeks, every possible way you could do them. To me I feel that it is helpful to know the different ways because everyone has a different learning style but perhaps cut down to a few to save curriculum time for other things. By the end of the lessons on systems everyone was begging me to be done.

In Pre-Calculus level one however, I found the curriculum to be not as straightforward. I didn't feel I really had a map of where to go next. I would sit down with Mrs. Razzaq and ask her to help me map the schedule out a few weeks because there weren't necessarily any guidelines as to where to go next. A flaw I found with this is sometimes the chronological order of things in the book didn't really match up. One week we did mortgage functions, which required log and ln functions, that hardly anyone knew, and the next week we actually learned log and natural log

functions. This could have been an error on my part yet the way the book sets it up and the way Mrs. Razzaq and I planned it out mortgage functions came before log functions, now why is this? I am not sure but I should have paid closer attention to these little details.

At Doherty, at the beginning of every week teachers submit a lesson plan that includes standards, framework, methodologies, assessment of learning, and homework as well as any additional comments about testing and such. I found these to be extremely useful so I knew what I was doing every day and what topic that was being covered. Yet one downfall I found was that sometimes it wasn't always realistic to get it all done how you planned it but it was a good starting point. I feel one strength teachers need to master is how to read their students to see if they understand what you're teaching and if not you need to take action and responsibility to continue going over it until you feel they comprehend it.

When I grew up and went to high school I was mainly in honors classes and everything was at a quick pace for myself. With my Honors Algebra II class I found them to be at the same pace with me, we could cover 2 or 3 sections in one week. For my two Pre-Calculus level one students I found we only made it through at most two sections a week because they just needed more time to grasp the concepts. At first this was my biggest struggle, some topics like logs and trig functions that always came easy to me didn't necessarily do the same for everyone else. I sometimes found myself frustrated as to how to break down this material for people to understand it. It was like going back in time to remember how I was taught it and how I could help out the students to get it as well.

I found sometimes it was helpful to do a day of teaching with some examples built in and then give them homework problems of about the same difficulty. The next day I would usually go over the homework to really see how everyone did with it on their own. Once I heard the “Ohhh, now I get it” I felt comfortable moving to a bit harder problems. I would then usually break students down into partners or small groups and perhaps those who understood what they were doing could help those who were still a little puzzled. I found peer work usually was always successful in my classed as long as I circulated the room and kept everyone on track. Mastering the art of keeping all of your students occupied and intrigued was something I always strived for!

Chapter 3 - Delivering Effective Instruction

Delivering Effective Instruction I would say is probably the biggest struggle most teachers face. You sit there in a room filled with 30 students and have to make sure they all understand what you are trying to say and the points you are trying to get across.

Through my observation hours I found Mrs. Razzaq has definitely mastered the art of how to keep everyone engaged and when someone looked bored or not engaged she knew how to pull them back into the lesson. After seeing this I knew this would definitely be a goal to strive for.

One of the most beneficial ways I found to get everyone engaged was through use of technology. It is crazy how this day and age students can just stare at technology like it was the greatest thing since sliced bread. As I recall in my high school days my teachers rarely used technology because it just wasn't an option

PowerPoint's became my new best friend. I found that by using PowerPoint's I had the highest engagement of my students versus notes on the board or anything else. It was also a good way for me to be on my toes and hands free. I was able to monitor the class much better than occasionally having my back turned to them writing notes on the board.

Now all is well with technology except for everyone's best friend "The Calculator". I found it was particularly sad how much students relied on calculators for simple multiplication and division! It really hit me during a test when I walked by a student typing 2 times 6 into a calculator. REALLY!?! After that I knew we needed to make adjustments.

I've had many teachers in high school, especially my AP Calculus teacher, who would never let us use calculators except when ABSOLUTLY necessary. As much as I hated it at the time I greatly appreciated that my teachers did that. I found it made me much sharper at my mental math and I could work through problems much quicker than stopping every few seconds to plug something so simple into a calculator. I decided to take this approach on my students.

I knew I would get some groaning and moaning from my students about this idea of using calculators only when absolutely necessary but I tried to create a happy medium. In my pre-calculus class I was giving a test on graphing where I taught them how to identify end behavior of graphs as well as points of intersections. I ended up taking an idea I had seen at WPI and split the test into two parts (Appendix D, Pg. 71-72). The first part was a blue paper where there were no calculators allowed, where they had to use the rules I taught them, and the second was a white paper where they were able to use calculators. As soon as they were done with the blue paper they could hand it in and grab a calculator and take the white piece of paper to finish the test. I found this way I could tell how many people actually studied and remembered the rules of graphs I had taught them. Now the main purpose however for the two different parts was so students couldn't simply type in the function on their calculator and copy the graph.

In my Algebra II class I also tried this rule of the less calculator use the better. I also found a happy medium with them in that I understood it would take students longer to finish a problem without a calculator so I bargained and made there be slightly less problems, allotting for more time to refine their basic algebra skills. I

also gave them problems that came out to full numbers so they could gauge if they were on the right track, but also warning them that most college professors aren't that lenient. I would usually leave a harder problem as a bonus for those who had extra time at the end.

The way Mrs. Razzaq structures her classroom was to have a chapter test every other week with a quiz on the in-between week. I found this to be a great idea so that whatever student struggled with on the quiz they could refine their skills for the test. The first week would essentially be introductory skills followed by the next week being more applied skills still using the basic skills learned the week before.

Project-

All is well with tests and quizzes but in previous school years Mrs. Razzaq would try to introduce some type of project to try and instill a little creativity in the classroom. As many people know it takes a lot of work to put together a project that was full proof and beneficial for everyone especially having to do with math. Seeing as I enjoy a challenge and Mrs. Razzaq was so eager in creating a project we put our minds together and created one. The goal here was to keep the student interested in a real life topic. I think one of the most common questions students ask everyday in class is "When am I ever going to use this in my life?" And to be quite honest sometimes I still don't know what the point was of learning how to multiply matrices was but we have to learn it.

The point of our project was to incorporate things everyday people would need to deal with and make it not so specific to a certain job path or whatnot. We

decided what is more common than purchasing a loan for a car or even a house? Almost everyone will have done this at some point in their lives so why not see it in school.

Before introducing the project we began with a week of introduction to compounding interest over certain periods of time as well as continuously and how to manipulate it to get certain results. At the end of the week we incorporated a quiz to see how the students were doing with what I taught. (Appendix- Project-Pre-Project Quiz)

The following Monday we incorporate the mortgage formula and did a few examples all together. I showed them different circumstances such as how beneficial having a down payment for a house can be in terms of saving money. The students were shocked to see how much money is wasted on interest itself. This introduction to the project really gave me a good feeling about this project because students were so appalled by the numbers they were seeing so I knew it kept them interested because some day that could be their money going to waste.

The following day we introduced the project (Below). There were 3 different versions of the project, A, B, and C. Students were allowed to work in groups and of which would have the same version. Each version gave students a different annual income and different stipulations yet asked the same types of questions. The first section introduced your income, as well as some up to date prices of homes in the neighborhood. The goal was for students to figure out how much their monthly payments would be and if they could afford each house depending on their different mortgage plans for 15 and 30 years.

The second part allowed for students to receive a raise. By getting this raise students then needed to reevaluate their current standings on if they could afford these homes. As an additional twist on this section we pulled into play a down payment as well as using the annuity formula.

Last but certainly not least we wanted to incorporate things perhaps a little more relevant to these students' lives in purchasing a vehicle. Many of the students currently drive or are going to be fairly soon so this part seemed very beneficial to them. In the end we asked some questions on whether buying a new car or used is more useful and we wanted them to use some information they gathered to back up their statement.

One last thing I wanted this project to touch upon was teamwork. Mrs. Razzaq and I gave everyone fair warning that this project was team based (with the exception of those working alone). We gave them a week to do the project in which we walked around to make sure everyone was participating and not goofing off. We made notes of those who we noticed weren't contributing and warned them of the late penalty if the project wasn't handed in on time.

In the end I conducted a survey to get a feel for how the project went. I was surprised to find out that 41 out of the 52 students preferred a project-based assessment to a test. Many reasoned that it was because they could be creative and they enjoyed working in groups. Overall all the students rated the project to be an 8.6, which I would consider a success. I received mainly 8's, 9's, and 10's and nothing less than a 6! Fifty out of the fifty-two students recommended this project for future students. In my book the project was a success and I am extremely happy

with how it turned out and hope it will continue on in future years!

A

Can I Afford This?

Buying a home may be one of the largest investments we make in our lifetimes. This activity will help you understand the many decisions behind financing a home.

3.25% for a 30 year mortgage

2.75% for a 15 year mortgage

Values of homes near Highland Street:

- \$257,000
- \$185,000
- \$380,000
- \$450,000

In order to pay for your mortgage, it is suggested that the monthly payment be no more than 28% of your monthly income.

1. You have an income of **\$50,000** a year. Which house(s) can you afford?
 2. What are the monthly mortgages (list 30 and 15 year options) for each of the homes from you selected from question #1?
 3. What is the **minimum monthly salary** needed to be able to pay for these mortgages?
-

4. You worked very hard, and you just got promoted. Congratulations! You make **\$82,000**. You plan to purchase a \$300,000 home in 5 years. You start an annuity to save enough money to put down a 15% down payment. You get paid biweekly (every other week) and every payday you put money aside for your future home. How much money do you need to put aside to reach your goal? The annuity has a 4% interest rate.

5. Congratulations, you have saved enough and you are ready to purchase your home (stated in #4). Remember, your total mortgage is the down payment subtracted from the cost of the home. With your new salary, can you afford this home? Explain

6. Think of a car you would like to purchase in the next 10 years. Interest rates for cars depend on many things such as the type of car and the life of the loan. Consider the following information:

- 48 month loan (used car) 4.26%
- 48 month loan (new car) 3.85%
- 36 month loan (used car) car 4.49%
- 36 month loan (new car) 3.73%

Using the information above, you are considering a used car for **\$7,000** and a new car for **\$30,000** what are your different monthly payments? Is it better to buy used or new? Explain.

Chapter 4- Managing Classroom Climate and Operation

I had the lovely opportunity of subbing for Mrs. Razzaq's 6th period class while doing my observation hours. This was when I really got a feel for how my student would be testing me. Although I wasn't their teacher just yet it was a very good way to lay down some laws before I did become their teacher. I recall addressing three different students with cell phones as well as one of my students leaving for the bathroom for about 20 minutes. Now I probably wasn't very prepared to handle this just yet not necessarily knowing the criteria of how to go about one of the students disappearing for that long however I made it known this was unacceptable. I think I handled it as well as I possibly could have at the time being.

I would say my first two weeks student teaching were what paved the path for my entire time there. I knew students would be testing me and seeing what they could get away with but it was up to me to make sure it was shut down very quickly. I view myself as a nice, fair person yet when being only 20 years old, about 2-3 years older than some of my students, I needed to show them I was in a position of authority.

I found cell phones to be my worst nightmare which I could have suspected by the way technology is so highly involved in everyone's lives now a days. How I initially went about it was to give a warning, telling the students to put their phones away, then the second time I would put it on my desk for them to get at the end of class. After about a week and a half to two weeks of this I finally became fed up. Being that I was just in high school 3 years ago I knew every trick there was to

hiding cell phones, the under the desk, the phone in the book, my personally favorite of the phone in the purse. I found more class time was wasted by having to interrupt the class the tell someone to put their phone away. I made the new rule and announced to all of my students that if I saw their cell phones out then there was no longer a warning but I would be taking it away. Also for those who became repeat offenders to this rule I would hand their phone over to their assistant Principal for them to retrieve at the end of the day.

It only ever got to this point with one student however. In my period 6 class I had I think was my worst behaved student. Constantly having his phone out, making rude/sly comments, interrupting class, he would do anything in his power to get some attention. But what would student teaching be without at least one troublemaker! This student caught my attention early on, mainly with constantly always having his cell phone out and then once this was shut down he started to act out because he had nothing else to do. One class he didn't feel like taking notes so instead he tried to antagonize all the other students. I warned him fairly, but as his behavior continued on it was time to remove him from the classroom because it wasn't fair to everyone else trying to learn that he was taking that away from them. After this mishap Mrs. Razzaq felt it was right to contact his mother. She has found that even when she was teaching he would act out and the fact he continued on doing it with me was unacceptable in her eyes. After that email which was promptly followed by his mother's response we found him to be on his best behavior. He was doing his homework and participating (correctly) in class, his grades even started to look up for a while.

Of course as the saying goes, all good things must come to an end. Toward the later half of my student teaching the behavior came back from this same student. I had caught him with his cell phone out during a test forcing him to receive a zero. Shortly thereafter we had a quiz, I told everyone to sit quietly with no cell phones out after handing in the quiz but what do you know he broke that rule as well. He was getting all too comfortable just handing his phone over to me to retrieve at the end of class that this time I advised him he would have to retain his cell phone at the end of the day from his assistant principal. He however did not like that answer so he caused a scene ripping the phone out of my hand. Luckily, Mrs. Razzaq was outside in the hallways so she escorted him down to the principal's office where he received two days of in-house suspension for many offenses.

As much as I struggled with how to handle this student I am glad I had the experience. Teaching, or more importantly life, has ups and downs and struggles you need to overcome. It helped open my eyes to other people's situations because luckily for me I was extremely fortunate growing up. Many of the times I found myself asking why was this student doing the things he did. Perhaps trouble at home? Lacking attention in some areas? Or maybe he even had a learning disability that no one had picked up on. I had a friend who only got diagnosed with a learning disability as a junior in high school and I often wonder how things could have been different for him. My sister has a learning disability but my mother caught on early enough to get her the help she needs. She is now being recognized for the highest GPA in her major at the University of New Hampshire. Basically what I am saying is everyone has difficulties but it is all the difference how you handle it.

Chapter 5- Promoting Equity

Promoting equity seems like a very straightforward topic of conversation in the classroom. No one student is above another. No one student should be treated any better or worse than another but I feel sometimes, as a teacher you need to make sure this is consistent. I would be lying if I didn't have some favorite students but I had to make sure I was fair to everyone.

Being fair is essential when being a teacher. When dealing with kids, high school kids especially, they will hold you to every word that comes out of your mouth! I found myself tongue tied sometimes, specifically on a quiz I said they could use their calculators early in the week yet forgot when the time came. I had to honor my words and follow through with what I said. After that happened I found it better to say "let me get back to you on that" so I could have a definite answer to give them.

With being fair and following up on your words I found I also had to be consistent with consequences. I had a total of two with a questionable third instance of cheating in my classroom. The first was on a homework in my period 3 Pre-Calculus class. One of my students didn't have her homework and was whispering to another student to give it to her in time for me to check it. We spoke in the hallway and her excuse was that the other student's grandfather died so she gave her her homework to copy. I explained to her how she was not helping this other student because she won't understand the material. She agreed and both students took a zero on the homework.

My next case of cheating was in my Honors Algebra II class on a test. It was quite obvious they cheated because I give out two different versions of the test so

one student copied the wrong problem and in fact the answer was wrong as well. To handle this I took them both outside and told the student who obviously cheated he would be receiving a zero and asked the other student if he had helped him cheat and sure enough he owned up to it and was honest and he also received a zero. High school is the time to learn from these mistakes because in college getting a zero won't be the only repercussion that comes with cheating.

Another topic of discussion that falls into the category of promoting equity would be the simple idea of materials being accessible to all students. Growing up I went to a private all girls' school where you were expected to have internet access as well as a laptop. Most students had Mac's and if not there were a number of available Mac desktops in the library for everyone to use. At Doherty that is not the case. Teaching at an inner city school was very different from my experience in many ways. Some students (none in my classes luckily) did not even have a textbook because there was a shortage of them in the school. While also at Doherty there was a shortage of paper, teachers actually had to hide paper in their drawers because someone would take it.

The main issue however with materials was making sure whatever homework was assigned, everyone had the means to do it. I didn't particularly find this an issue in math yet I could see it being an issue in other subjects. I never required my students to need internet at home yet Mrs. Razzaq makes sure to take a poll at the beginning of the school year to know. Mrs. Razzaq uses Engrade, which is an online grade book that all of her students have access to as well as their parents. I found this to be the greatest tool because it keeps a calculated average of how you

are doing in the class up to date because I cannot tell you how many times students ask how they are doing at a certain point in time. Knowing everyone had Internet was also a plus however. Not every student at home had a fancy graphing calculator which was necessary sometimes but Mrs. Razzaq gave many resources for online calculators as well as a website called Desmos that we even used in class on the projector. Mrs. Razzaq, I want to say was one of few or perhaps the only who had a projector mounted on the ceiling to use which allowed for me to get creative with my teaching.

Chapter 6- Meeting Professional Responsibilities

One of my greatest struggles coming into student teaching would have to be my age. Seeing as I am only 20 years old and many of my students were not far behind me, the first thing I had to do was build the barrier of being their teacher and not their friend. Through observing Mrs. Razzaq she had always tried to help the situation by placing me at her desk from day one showing the students I was in a place of authority.

The way Mrs. Razzaq handled her class was remarkable. She has really become a role model to me. I had my ups and downs while teaching but one thing I noticed about Mrs. Razzaq is that it never made her not want to come to work and do her job for the simple fact she loved doing it. I really don't know if I have ever met a teacher that gets that excited about an awesome lesson plan like she does!

There was a point in my student teaching experience I didn't want to continue on and frankly without Mrs. Razzaq it would have been much more of a struggle. The beginning weeks I had braced myself for laying down the law and setting boundaries and my classes had finally settled in just right. At about halfway through my teaching experience I had one really bad week. I received a not so kind email from one of my students on Engrade. It was before my first class of the day as I was in the back room preparing my lesson plan when a student emailed me and said "B****, you got no teeth", now normally I would just laugh it off at the horrible use of English as well as the fact I highly doubted the email came from this student but it hit a sensitive spot for me. I have many teeth issues, more than I care to share but I had always been bullied and made fun of growing up. I realized high school students

can be mean but you need to rise above it.

In this same day Mrs. Razzaq had also received a rude email yet she was not in class this day so I had to handle it myself. I handed it over to the Principal and tried to put it out of my mind the rest of the day no matter how distraught I was. It pained me being in class knowing some student(s) had such ill feelings towards me or just to the teaching authority in general it was really discouraging. To be honest at this point I didn't even want to be there.

The next day Mrs. Razzaq was in and really helped me put things in perspective. I admired her opinion on the situation in that any student who feels the need to be so rude and disrespectful to others, not only their teachers, was not going to do anything with their life. How could they get a respectable job by disrespecting people of authority? In the end I kept my head up and didn't let it effect my teaching, for every student who didn't like me I found there were more who did like me and appreciated what I did as a teacher. Those are the kids that made me excited to come to teach and I can see that's why Mrs. Razzaq did as well.

Meeting professional responsibilities means you show up to work everyday to teach and love what you do. You don't let all the little drama get in the way and you come to do your job. You follow through with your word and hold all of your students accountable for their mistakes. One thing I really took away from teaching was that you have to love what you do.

Chapter 7- WPI Education

First off I would like to mention how fortunate I have been in my education thus far. The amount of opportunities that have come my way have been incredible. Starting off in a public school in Rhode Island I took mainly all honors classes (except for English, that was never my forte) and excelled in most things I had done. In the 10th grade I was given the opportunity to attend a private all girls school where I was recruited for basketball. Personally from my perspective I found I actually got less work at this school than public school people teachers never really encouraged busy work. I had an outstanding basketball coach, as well as opportunities to play in AAU basketball tournaments around the East coast. I would say basketball is the reason I ended up at WPI. The coaches recruited me and soon after I committed to WPI, only to find out basketball wasn't really my passion within the first year. I don't regret my decision because I am so thankful to be where I am today.

I think after being at WPI for a little over two and a half years now I have been able to master what works and doesn't work for me. In high school I never really had to study so that was certainly a wakeup call when I came to WPI. My freshman year was sort of a challenge but still didn't force me to get my act together until about sophomore year.

I think if there was one thing I wish I had taken away from high school it would be how to study and what techniques worked for me. I found many of my professors at WPI typically just write down notes on the board and it was your job to take the information away from it. What my approach was at Doherty was to try

and teach students in different ways, i.e., PowerPoint's, notes on the board, guided notes etc, to see if maybe they could figure out what works for them. Essentially they needed to be given tools to take responsibility and master it on their own.

One of the downfalls to this however was student's lack of discipline. I found many of my students expected things to be handed to them and in the real world that is not going to happen. We had a test one week on the unit circle and this was a topic that definitely needed studying outside of the classrooms to master the steps and uses of it. I assigned no formal written homework that week but just to memorize certain parts of the unit circle and tricks to remember it, which they would have to show on a "Do-Now" activity the following morning. Like I suspected many students did well yet still a significant amount did not do so well. I felt very discouraged after in thinking this was my fault some students did not do well. I discussed with Mrs. Razzaq and she helped me see that I had told them so many times they needed to study and sometimes students need to make a mistake to see the consequences of their actions.

In my education and my life I have always been held to such high standards by my teachers, my parents, and my coaches it feels unacceptable to not follow through on things. One thing I tried to leave behind to my students was that they must take responsibility for themselves. Many of my students were juniors and seniors preparing for college who had no clue what they were getting themselves into. I tried to reiterate to them that college professors have hundreds of students to worry about and their sad story of why they didn't get their homework done won't always be heard. Professors don't have the time to always have a personal

connection with all of their students like many teachers do in high school.

I think by giving students the perspective of someone in college they are more likely to listen to what I have to say about things. I recall in high school my very “aged” AP Calculus teacher telling us about her college days but to me it seemed too ancient that most things went in one ear and out the other. I think that by taking two classes at WPI as well as teaching I found some things to relate to my students. I took two psychology classes over the time period and it really broadened my horizons. I learned about cross-cultural psychology as well as learning disabilities, which was very interesting taking into consideration some of my students had learning disabilities. I tried to build a sense of trust with my students so they really took what I had to say into consideration. I found I had to push my students to make them care about their performance and to be honest I think I did just that.

Chapter 8- The Classroom

To begin talking about my classes, I took over an Honors Algebra II class as well as two Level I, Pre-Calculus classes. I would say between the three classes there is a broad spectrum of students. While observing, I also watched Mrs. Razzaq's Honors Calculus class which also had a different group of students.

Observation-

Through observing Mrs. Razzaq it has taught me a lot. She is a very nice woman, would do anything for you but she lays down the law and won't let anyone get away with things. I feel her students enjoy her personality but know not to cross the line and when the occasional student does they are punished correctly. While watching Mrs. Razzaq I think she has mastered the art of keeping her students engaged the whole time, even if someone puts their head down she will address them and that is the end of it. Another thing I value from her is the way she handles behavioral problems, she gets the last word and shuts down whoever is acting up without causing a huge uproar. Some students try and keep the argument going but she doesn't even bother entertaining it and continues on. I feel all of Mrs. Razzaq's students respect her and that is a very important trait to have as a teacher. With all of these great traits comes great lesson plans. It makes me happy to see how much Mrs. Razzaq loves teaching, she always gets excited about lesson plans which now that I have started teaching I get excited when I have a great lesson plan! Overall I could not have asked for a better mentor, I am very thankful for Mrs. Razzaq!

Period 3-

For period 3 Pre-Calculus I had no major behavioral problems, except for a few here and there but for the most part they were all dedicated hard working students! All of these students came ready and prepared for class with a rare missing homework assignment. Some students I could even see fitting in just fine in the Honors Pre-Calculus yet they exceptionally well in Level 1. This classes strength I would say is not complaining and they ask many good questions. One weakness I would say is the chatting between friends but that was simple fix by changing seats which Mrs. Razzaq has done! Overall I enjoy the class and the students very much.

Period 4-

Period 4 Algebra II honors would have to be one of my favorite classes, for the material as well as the students. I would say these students were the hardest working out of any of my classes, I believe they truly wanted to learn and everyone puts in a great effort. Similar to period 3, there is rarely missing homework in this class unless they were absent which they get an extra day for, everyone brings in their homework and actively participates. One weakness of this class would also be the chattiness. There is a group of boys who are all great friends who would occasionally get a little rowdy but they settled right now when addressed. There were always great conversations in this class, no one is afraid to ask questions and I feel by asking questions it helps even the whole class understand the topic better.

Period 6-

Lastly, period 6 was by far my toughest class. Funny enough this class gets better grades than period 3(also Pre-Calculus Level I) but there were a lot of

behavior issues as well as complaining. A lot of the students wanted everything handed to them, they didn't want to think. Some other students were just lazy and didn't want to do the work even though they were very intelligent. I had one main troublemaker, which I mentioned in previous chapters, who was also good friends with another student who was very intelligent but seemed to bring him down with him. There were so many students with great potential in that class but they didn't want to put in the effort. This class I would say was very vocal however not in a great way, mostly with complaining saying they don't get it when they really did. This class didn't seem to ever stay after for extra help yet they seem like the class who is most puzzled with the material. Quite interesting. As much as this class was my biggest struggle what would student teaching be without some bumps in the road to learn from?

Conclusion-

Overall my experience student teaching was nothing but beneficial to me as a student and person. Whether I become a teacher or an Actuary I can take away so much from this experience. Teaching others is a life skill and when your message is relayed to them is the most rewarding feeling.

One of the greatest skills I took away would be communication. I have always found myself to be a people person but having to think on your feet in front of a class of 30 kids that are all judging you is harder than it looks. I have an even greater respect for teachers and all the hard work they put into teaching. It is definitely not as easy as it looks!

I feel extremely thankful for the opportunity I was given by WPI to also accomplish receiving my teaching certificate while attaining a major in Actuarial Mathematics. Through this experience I feel it easily prepared myself for becoming a Licensed Teacher in the state of Massachusetts and I thank everyone who made that possible.

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Appendix A- Lesson Plans

Algebra II

Week of October 20th (Monday, Tuesday, Wednesday)

WEEKLY LESSON PLAN			
Doherty Memorial High School Worcester Public Schools			
Department :	MATH		
COURSE : Algebra II			
Weekly Objectives : Students will be able to solve polynomials by using the quadratic formula as well as gr			

Monday		Tuesday		Wednesday	
Framework	Algebra II	Framework	Algebra II	Framework	
Standard #(s)	REI.B.4.B	Standard #(s)	REI.B.4.B/REI.D.12	Standard #(s)	REI.D.12
Quadratic Formula		Formula/Quadratic Inequalities tables/s		Graphing Quadratic Inequalities	
Do Now: Complete the Square		DO NOW solve using the quadratic fo		DOW NOW solve the inequality	
E-Day		F-Day		A-Day	
Methodologies		Methodologies		Methodologies	
<input checked="" type="checkbox"/>	Lecture	<input checked="" type="checkbox"/>	Lecture	<input checked="" type="checkbox"/>	Lecture
<input checked="" type="checkbox"/>	Teacher Modeling	<input type="checkbox"/>	Teacher Modeling	<input type="checkbox"/>	Teacher Mode
<input checked="" type="checkbox"/>	Media Presentation	<input type="checkbox"/>	Media Presentation	<input type="checkbox"/>	Media Present
<input type="checkbox"/>	Small Group	<input type="checkbox"/>	Small Group	<input checked="" type="checkbox"/>	Small Group
<input type="checkbox"/>	Class/Group Discussion Question/answer	<input checked="" type="checkbox"/>	Class/Group Discussion Question/answer	<input type="checkbox"/>	Class/Group Di Question/answ
<input checked="" type="checkbox"/>	Guided Practice	<input checked="" type="checkbox"/>	Guided Practice	<input checked="" type="checkbox"/>	Guided Practic
<input checked="" type="checkbox"/>	Independent practice	<input checked="" type="checkbox"/>	Independent practice	<input type="checkbox"/>	Independent p
<input type="checkbox"/>	Computer Lab Science Lab	<input type="checkbox"/>	Computer Lab Science Lab	<input type="checkbox"/>	Computer Lab Science Lab
<input type="checkbox"/>	Calculator	<input type="checkbox"/>	Calculator	<input type="checkbox"/>	Calculator
Assessments of learning:		Assessments of learning:		Assessments of learning:	
<input checked="" type="checkbox"/>	Individual Group	<input checked="" type="checkbox"/>	Individual Group	<input checked="" type="checkbox"/>	Individual Group
<input checked="" type="checkbox"/>	Written Oral	<input checked="" type="checkbox"/>	Written Oral	<input checked="" type="checkbox"/>	Written Oral
Finish Worksheet from class		pg. 304 28-28 ALL Pg. 305 48-50 ALL		pg. 304 6-14 ALL show graphs, x- intercepts, shading	

Week of October 27th (Monday, Tuesday, Wednesday)

WEEKLY LESSON PLAN					
Doherty Memorial High School Worcester Public Schools					
Department :		MATH			
COURSE :			Algebra II		
Weekly Objectives : Students will be able to evaluate operations of exponents and to solve for n th roots the					
Monday		Tuesday		Wednesday	
Framework	Algebra II	Framework	Algebra II	Framework	Algebra II
Standard #(s)	IF.C.8.B	Standard #(s)	IF.C.8.B	Standard #(s)	IF.C.8.B
Properties of Exponents		Properties of exponents/ 6.1 n th roots		roots continued/ Solving Radical Equa	
Do Now: Complete the square no calculat		DO NOW		DOW NOW	
D-Day	Period 4 Long	E-Day		F-Day	
Methodologies		Methodologies		Methodologies	
<input checked="" type="checkbox"/>	Lecture	<input checked="" type="checkbox"/>	Lecture	<input checked="" type="checkbox"/>	Lecture
<input checked="" type="checkbox"/>	Teacher Modeling	<input checked="" type="checkbox"/>	Teacher Modeling	<input checked="" type="checkbox"/>	Teacher Mode
<input checked="" type="checkbox"/>	Media Presentation	<input type="checkbox"/>	Media Presentation	<input checked="" type="checkbox"/>	Media Present
<input type="checkbox"/>	Small Group	<input type="checkbox"/>	Small Group	<input checked="" type="checkbox"/>	Small Group
<input type="checkbox"/>	Class/Group Discussion Question/answer	<input checked="" type="checkbox"/>	Class/Group Discussion Question/answer	<input type="checkbox"/>	Class/Group Di Question/answ
<input checked="" type="checkbox"/>	Guided Practice	<input checked="" type="checkbox"/>	Guided Practice	<input checked="" type="checkbox"/>	Guided Practic
<input type="checkbox"/>	Independent practice	<input checked="" type="checkbox"/>	Independent practice	<input checked="" type="checkbox"/>	Independent p
<input type="checkbox"/>	Computer Lab Science Lab	<input type="checkbox"/>	Computer Lab Science Lab	<input type="checkbox"/>	Computer Lab Science Lab
<input checked="" type="checkbox"/>	Calculator	<input checked="" type="checkbox"/>	Calculator	<input checked="" type="checkbox"/>	Calculator
Assessments of learning:		Assessments of learning:		Assessments of learning:	
<input type="checkbox"/>	Individual Group	<input type="checkbox"/>	Individual Group	<input type="checkbox"/>	Individual Group
<input type="checkbox"/>	Written Oral	<input type="checkbox"/>	Written Oral	<input type="checkbox"/>	Written Oral
Pg. 333 24-35		Kuta Worksheet on n th roots		Pg. 456 3-6 & 13-16 & 23-25	

Week of October 27th (Thursday, Friday)

		Teacher :	Coia				
				Week of :	10/27/14		

is being able to solve for radical expressions.

Thursday		Friday		Notes/Comments: Quiz on Properties of exponents as well as finding the nth roots thus being able to solve radical expressions.
Framework	Algebra II	Framework	Algebra II	
Standard #(s)	IF.C.8.B	Standard #(s)		
Solving Radical Equations		Quiz		
DO NOW				
A-Day		B-Day		
Methodologies		Methodologies		
ng	<input checked="" type="checkbox"/>	Lecture Teacher Modeling	<input type="checkbox"/>	Lecture Teacher Modeling
tion	<input type="checkbox"/>	Media Presentation	<input type="checkbox"/>	Media Presentation
	<input checked="" type="checkbox"/>	Small Group	<input type="checkbox"/>	Small Group
ussion r	<input checked="" type="checkbox"/>	Class/Group Discussion Question/answer	<input type="checkbox"/>	Class/Group Discussion Question/answer
	<input checked="" type="checkbox"/>	Guided Practice	<input type="checkbox"/>	Guided Practice
ctice	<input type="checkbox"/>	Independent practice	<input checked="" type="checkbox"/>	Independent practice
	<input type="checkbox"/>	Computer Lab Science Lab	<input type="checkbox"/>	Computer Lab Science Lab
	<input checked="" type="checkbox"/>	Calculator	<input checked="" type="checkbox"/>	Calculator
Assessments of learning:		Assessments of learning:		
	<input checked="" type="checkbox"/>	Individual Group	<input checked="" type="checkbox"/>	Individual Group
	<input checked="" type="checkbox"/>	Written Oral	<input checked="" type="checkbox"/>	Written Oral
Study		no homework		

Pre-Calculus

Week of October 20th (Monday, Tuesday, Wednesday)

WEEKLY LESSON PLAN					
Doherty Memorial High School					
Worcester Public Schools					
Department :		Math			
COURSE :			Pre-Calculus		
Weekly Objectives : Students will be able to solve the division of polynomials through long division as v					
Monday		Tuesday		Wednesday	
Framework	Pre-Calculus	Framework	Pre-Calculus	Framework	Pre-Calculus
Satndard #(s)	APR.A.1	Satndard #(s)	APR.A.1	Satndard #(s)	APR.B.2
Long Division of Polynomials		Long Division Review/Intro Synthetic		Synthetic Division/ Remainder Theorem	
SIP DO NOW Long Division Problem		SIP DO NOW Long Division Polynomial		SIP DO NOW Synthetic Division	
E- Day		F-Day		A-Day	
Methodologies		Methodologies		Methodologies	
<input checked="" type="checkbox"/>	Lecture	<input checked="" type="checkbox"/>	Lecture	<input checked="" type="checkbox"/>	Lecture
<input checked="" type="checkbox"/>	Teacher Modeling	<input checked="" type="checkbox"/>	Teacher Modeling	<input checked="" type="checkbox"/>	Teacher Modeling
<input type="checkbox"/>	Media Presentation	<input checked="" type="checkbox"/>	Media Presentation	<input type="checkbox"/>	Media Present
<input type="checkbox"/>	Small Group	<input type="checkbox"/>	Small Group	<input type="checkbox"/>	Small Group
<input type="checkbox"/>	Class/Group Discussion	<input type="checkbox"/>	Class/Group Discussion	<input type="checkbox"/>	Class/Group Discussion
<input type="checkbox"/>	Question/answer	<input type="checkbox"/>	Question/answer	<input type="checkbox"/>	Question/answer
<input checked="" type="checkbox"/>	Guided Practice	<input checked="" type="checkbox"/>	Guided Practice	<input checked="" type="checkbox"/>	Guided Practice
<input checked="" type="checkbox"/>	Independent practice	<input type="checkbox"/>	Independent practice	<input type="checkbox"/>	Independent practice
<input type="checkbox"/>	Computer Lab	<input type="checkbox"/>	Computer Lab	<input type="checkbox"/>	Computer Lab
<input type="checkbox"/>	Science Lab	<input type="checkbox"/>	Science Lab	<input type="checkbox"/>	Science Lab
<input type="checkbox"/>	Calculator	<input type="checkbox"/>	Calculator	<input type="checkbox"/>	Calculator
Assessments of learning:		Assessments of learning:		Assessments of learning:	
<input checked="" type="checkbox"/>	Individual	<input checked="" type="checkbox"/>	Individual	<input checked="" type="checkbox"/>	Individual
<input type="checkbox"/>	Group	<input type="checkbox"/>	Group	<input type="checkbox"/>	Group
<input checked="" type="checkbox"/>	Written	<input checked="" type="checkbox"/>	Written	<input checked="" type="checkbox"/>	Written
<input checked="" type="checkbox"/>	Oral	<input type="checkbox"/>	Oral	<input type="checkbox"/>	Oral
Homework : Pg. 124 9-20 ALL		Homework : Pg. 124 23-30 ALL		Homework : Pg. 125 43 & 44 All parts	

Week of October 27th (Monday, Tuesday, Wednesday)

WEEKLY LESSON PLAN					
Doherty Memorial High School					
Worcester Public Schools					
Department :		Math			
COURSE :			Pre-Calculus		
Weekly Objectives : Students will be able to identify all asymptotes and holes as well as graph rational					
Monday		Tuesday		Wednesday	
Framework	Pre-Calculus	Framework	Pre-Calculus	Framework	Pre-Calculus
Standard #(s)	IF.C.7.D	Standard #(s)	IF.C.7.D	Standard #(s)	
Shifting parent graph of 1/x		Identify asymptotes/Graphing all asymptotes		No Class	
SIP DO NOW Find all asymptotes, holes		SIP DO NOW Graph and shift parent function		SIP	
o-day	3rd period long	d-Day		e-Day	
Methodologies		Methodologies		Methodologies	
<input checked="" type="checkbox"/>	Lecture	<input checked="" type="checkbox"/>	Lecture	<input type="checkbox"/>	Lecture
<input checked="" type="checkbox"/>	Teacher Modeling	<input checked="" type="checkbox"/>	Teacher Modeling	<input type="checkbox"/>	Teacher Modeling
<input checked="" type="checkbox"/>	Media Presentation	<input checked="" type="checkbox"/>	Media Presentation	<input type="checkbox"/>	Media Presentation
<input type="checkbox"/>	Small Group	<input type="checkbox"/>	Small Group	<input type="checkbox"/>	Small Group
<input type="checkbox"/>	Class/Group Discussion	<input type="checkbox"/>	Class/Group Discussion	<input type="checkbox"/>	Class/Group Discussion
<input type="checkbox"/>	Question/answer	<input type="checkbox"/>	Question/answer	<input type="checkbox"/>	Question/answer
<input checked="" type="checkbox"/>	Guided Practice	<input checked="" type="checkbox"/>	Guided Practice	<input type="checkbox"/>	Guided Practice
<input type="checkbox"/>	Independent practice	<input type="checkbox"/>	Independent practice	<input type="checkbox"/>	Independent practice
<input type="checkbox"/>	Computer Lab	<input type="checkbox"/>	Computer Lab	<input type="checkbox"/>	Computer Lab
<input type="checkbox"/>	Science Lab	<input type="checkbox"/>	Science Lab	<input type="checkbox"/>	Science Lab
<input type="checkbox"/>	Calculator	<input type="checkbox"/>	Calculator	<input type="checkbox"/>	Calculator
Assessments of learning:		Assessments of learning:		Assessments of learning:	
<input checked="" type="checkbox"/>	Individual	<input checked="" type="checkbox"/>	Individual	<input type="checkbox"/>	Individual
<input type="checkbox"/>	Group	<input type="checkbox"/>	Group	<input type="checkbox"/>	Group
<input checked="" type="checkbox"/>	Written	<input checked="" type="checkbox"/>	Written	<input type="checkbox"/>	Written
<input type="checkbox"/>	Oral	<input type="checkbox"/>	Oral	<input type="checkbox"/>	Oral
Homework :Pg. 157 5-12		Homework : pg. 158 (49-56) & (65-70)		Homework :	

Week of October 27th (Thursday, Friday)

	Teacher :	Coia			

Week of : 11/3/14

unctions.

Thursday		Friday		Notes/Comments: Test on imaginary Numbers, Asymptotes and parent graphs and shifting
Framework	Pre-Calculus	Framework	Pre-Calculus	
Standard #(s)	IF.C.7.D/CN.A.2	Standard #(s)		
Review-Complex Numbers, Asymptotes, g		Test		
SIP DO NOW		SIP		
Friday		Friday		
Methodologies		Methodologies		
ing	<input type="checkbox"/> Lecture <input type="checkbox"/> Teacher Modeling	ing	<input type="checkbox"/> Lecture <input type="checkbox"/> Teacher Modeling	
tion	<input type="checkbox"/> Media Presentation	tion	<input type="checkbox"/> Media Presentation	
	<input checked="" type="checkbox"/> Small Group		<input type="checkbox"/> Small Group	
ussion r	<input checked="" type="checkbox"/> Class/Group Discussion <input checked="" type="checkbox"/> Question/answer	ussion r	<input type="checkbox"/> Class/Group Discussion <input type="checkbox"/> Question/answer	
	<input checked="" type="checkbox"/> Guided Practice		<input type="checkbox"/> Guided Practice	
actice	<input checked="" type="checkbox"/> Independent practice	actice	<input checked="" type="checkbox"/> Independent practice	
	<input checked="" type="checkbox"/> Computer Lab <input type="checkbox"/> Science Lab		<input type="checkbox"/> Computer Lab <input type="checkbox"/> Science Lab	
	<input checked="" type="checkbox"/> Calculator		<input type="checkbox"/> Calculator	
Assessments of learning:		Assessments of learning:		
	<input checked="" type="checkbox"/> Individual Group		<input checked="" type="checkbox"/> Individual Group	
	<input checked="" type="checkbox"/> Written Oral		<input checked="" type="checkbox"/> Written Oral	
Homework : Study for test		Homework :		

Appendix B- PowerPoint's

Synthetic Division (Pre-Calculus)

Synthetic Division

Let's start with the function:

$$\frac{x^4 - 10x^2 - 2x + 4}{x + 3}$$

First Step: Draw these 2 lines...



Second Step: Place the opposite of the x^0 coefficient of the binomial equation $x+3$ outside the line in top left corner



Third Step: Fill in the coefficients of the polynomial equation $x^4 - 10x^2 - 2x + 4$ along the first line

$$\begin{array}{r|cccccc} -3 & 1 & 0 & -10 & -2 & 4 \end{array}$$

HINT: Leave spaces for variables of x with a **zero** coefficient.

Fourth Step: Pull Down the first coefficient under the horizontal line

$$\begin{array}{r|cccccc} -3 & 1 & 0 & -10 & -2 & 4 \\ & \downarrow & & & & \end{array}$$

Fifth Step: Multiply -3 and 1 and plug in answer under 0

$$\begin{array}{r|cccccc} -3 & 1 & 0 & -10 & -2 & 4 \\ & \vdots & & & & \\ & \downarrow & & & & \\ & & -3 & & & \\ \hline & 1 & & & & \end{array}$$

$-3 \times 1 = -3$

Sixth Step: Add 0 + (-3) and plug the answer under the line

$$\begin{array}{r|cccccc} -3 & 1 & 0 & -10 & -2 & 4 \\ & \vdots & & & & \\ & \downarrow & & & & \\ & & +(-3) & & & \\ \hline & 1 & -3 & & & \end{array}$$

Seventh Step: Multiply again

$$\begin{array}{r|cccccc} -3 & 1 & 0 & -10 & -2 & 4 \\ & \vdots & & & & \\ & \downarrow & & & & \\ & & -3 & 9 & & \\ \hline & 1 & -3 & & & \end{array}$$

$-3 \times -3 = 9$

Eighth Step: Add again

$$\begin{array}{r|cccccc} -3 & 1 & 0 & -10 & -2 & 4 \\ & \vdots & & & & \\ & \downarrow & & & & \\ & & -3 & +9 & & \\ \hline & 1 & -3 & -1 & & \end{array}$$

Ninth Step: Multiply again

$$\begin{array}{r|cccccc} -3 & 1 & 0 & -10 & -2 & 4 \\ & \vdots & & & & \\ & \downarrow & & & & \\ & & -3 & 9 & 3 & \\ \hline & 1 & -3 & -1 & & \end{array}$$

$-3 \times -1 = 3$

Tenth Step: Add again

$$\begin{array}{r|cccccc} -3 & 1 & 0 & -10 & -2 & 4 \\ & \vdots & & & & \\ & \downarrow & & & & \\ & & -3 & 9 & +3 & \\ \hline & 1 & -3 & -1 & 1 & \end{array}$$

How do you express a remainder?

What is left: 1
Over Binomial: $(x+3)$

***If the remainder is 0 the equation you found is a factor of the polynomial, which means it could have been done by factoring.

Finally

$$\begin{array}{r}
 -3 \quad \left| \begin{array}{cccccc}
 1 & 0 & -10 & -2 & 4 & \\
 & -3 & 9 & 3 & -3 & \\
 \hline
 1 & -3 & -1 & 1 & 1 & \boxed{1}
 \end{array} \right. \\
 1x^3 - 3x^2 - 1x^1 + 1 + (1/(x+3))
 \end{array}$$

Our answer is....

$$\begin{array}{r}
 \frac{x^4 - 10x^2 - 2x + 4}{x + 3} \\
 \text{Equals} \\
 x^3 - 3x^2 - x^1 + 1 + (1/(x+3))
 \end{array}$$

Lets walk through one more...

$$\begin{array}{r}
 \frac{3x^3 + 8x^2 + 5x - 7}{x + 2}
 \end{array}$$

Multiplying Matrices (Algebra II)

Multiplying Matrices

First things first how do we read the dimension of a matrix?

For example: $m \times n$

$$\begin{bmatrix} 7 & 4 & 9 \\ 8 & 1 & 5 \end{bmatrix}$$

First things first how do we read the dimension of a matrix?

For example: $m \times n$

$m =$ rows
 $n =$ columns

So this is 2 rows by 3 columns which is a 2×3

ORDER MATTERS!

$$\begin{bmatrix} 7 & 4 & 9 \\ 8 & 1 & 5 \end{bmatrix}$$

Rules of multiplying Matrices

In order to find the product of two matrices, say $A \cdot B$:

- There must be the same amount of columns in A as there are rows in B

ORDER MATTERS!!

Rules

In order to find the product of two matrices, say $A \cdot B$:

- There must be the same amount of columns in A as there are rows in B

Matrix A	Matrix B	
$\begin{bmatrix} 7 & 3 \\ 2 & 5 \\ 6 & 8 \\ 9 & 0 \end{bmatrix}$	$\begin{bmatrix} 7 & 4 & 9 \\ 8 & 1 & 5 \end{bmatrix}$	$A = 4 \times 2$ $B = 2 \times 3$

\uparrow 2 columns \uparrow 2 Rows

Rules

In order to find the product of two matrices, say $A \cdot B$:

- There must be the same amount of columns in A as there are rows in B

Matrix A	Matrix B	$A = 4 \times 2$ $B = 2 \times 3$ $2 = 2$ so
$\begin{bmatrix} 7 & 3 \\ 2 & 5 \\ 6 & 8 \\ 9 & 0 \end{bmatrix}$	$\begin{bmatrix} 7 & 4 & 9 \\ 8 & 1 & 5 \end{bmatrix}$	YES it works!

\uparrow 2 columns \uparrow 2 Rows

+ Say we switch the order of multiplication and wanted to do $B \cdot A$, could we?

$$B = 2 \times 3$$

$$A = 4 \times 2$$

+ Say we switch the order of multiplication and wanted to do $B \cdot A$, could we?

$$B = 2 \times 3$$

$$A = 4 \times 2$$

$$3 \neq 4$$

So NO!

NOT DEFINED

+ Definition by the book...

Multiplying Matrices

Words To find the element in the i th row and j th column of the product matrix AB , multiply each element in the i th row of A by the corresponding element in the j th column of B , then add the products.

$$\text{Algebra } \begin{matrix} A & B & AB \\ \begin{bmatrix} a & b \\ c & d \end{bmatrix} & \cdot \begin{bmatrix} e & f \\ g & h \end{bmatrix} & = \begin{bmatrix} ae + bg & af + bh \\ ce + dg & cf + dh \end{bmatrix} \end{matrix}$$

+ This probably looks like a foreign language to you so lets try an example and you will get the hang of it...

Appendix C- Project

Pre-Project Quiz

Pre-Calculus
Quiz on Compounding Interest

Name _____

Date _____

1. If you deposit \$4000 into an account paying 6% annual interest compounded quarterly, how much money will be in the account after 5 years?
2. If you deposit \$6500 into an account paying 8% annual interest compounded monthly, how much money will be in the account after 7 years? |
3. If you deposit \$5000 into an account paying 6% annual interest compounded monthly, how long until there is \$8000 in the account?
4. If you deposit \$8000 into an account paying 7% annual interest compounded quarterly, how long until there is \$12400 in the account?
5. At 3% annual interest compounded monthly, how long will it take to double your money?

Pre-Calculus
Quiz on Compounding Interest

6. How much money would you need to deposit today at 5% annual interest compounded monthly to have \$20000 in the account after 9 years?

 7. If you deposit \$5000 into an account paying 8.25% annual interest compounded semiannually, how long until there is \$9350 in the account?

 8. If you deposit \$3000 dollars into an account today, compounded monthly, and on this day next year you take your money out and have \$3,800 dollars, what is your interest rate?

 9. If you get \$6,700 dollars after you invest your money into an account for 10 years compounded continuously, how much money did you invest in the first place with a 4% interest rate?

 10. Bob invests \$2,500 into an account that pays 3.25% compounded daily. He leaves the money in this account for 3 years. After the three years he wants to switch banks. He takes the money out of the first account after those three years and into another account that pays 3% interest compounded weekly for 2 years.
 - A.) How much money will Bob get out after those 5 years?

 - B.) How much money would Bob get if he had just left his money in the original bank for those 5 years?

 - C.) Which investment path should Bob have chosen? A or B and WHY?
-

Project

Can I Afford this? (Pre-Calculus)

A

Can I Afford This?

Buying a home may be one of the largest investments we make in our lifetimes. This activity will help you understand the many decisions behind financing a home.

3.25% for a 30 year mortgage

2.75% for a 15 year mortgage

Values of homes near Highland Street:

- \$257,000
- \$185,000
- \$380,000
- \$450,000

In order to pay for your mortgage, it is suggested that the monthly payment be no more than 28% of your monthly income.

1. You have an income of **\$50,000** a year. Which house(s) can you afford?
2. What are the monthly mortgages (list 30 and 15 year options) for each of the homes from you selected from question #1?
3. What is the **minimum monthly salary** needed to be able to pay for these mortgages?

4. You worked very hard, and you just got promoted. Congratulations! You make **\$82,000**. You plan to purchase a \$300,000 home in 5 years. You start an annuity to save enough money to put down a 15% down payment. You get paid biweekly (every other week) and every payday you put money aside for your future home. How much money do you need to put aside to reach your goal? The annuity has a 4% interest rate.

5. Congratulations, you have saved enough and you are ready to purchase your home (stated in #4). Remember, your total mortgage is the down payment subtracted from the cost of the home. With your new salary, can you afford this home? Explain

6. Think of a car you would like to purchase in the next 10 years. Interest rates for cars depend on many things such as the type of car and the life of the loan. Consider the following information:

- 48 month loan (used car) 4.26%
- 48 month loan (new car) 3.85%
- 36 month loan (used car) car 4.49%
- 36 month loan (new car) 3.73%

Using the information above, you are considering a used car for **\$7,000** and a new car for **\$30,000** what are your different monthly payments? Is it better to buy used or new? Explain.

Project Exemplar

Version A ~ Financing a Home + Car ~

Values of Homes Near Highland St.

- \$257,000
- \$185,000
- \$380,000
- \$450,000

1) Income: \$50,000 a year.
- Therefore, I can afford the first and second homes on a 30-year mortgage.

2) Monthly Mortgages:

- \$257,000-
A = \$1,744.06 for 15 years ✓
A = \$1,118.48 for 30 years ✓
- \$185,000-
A = \$1,256.45 for 15 years ✓
A = \$805.13 for 30 years ✓
- \$380,000-
A = \$2,578.76 for 15 years ✓
A = \$1,653.78 for 30 years ✓
- \$450,000-
A = \$3,053.80 for 15 years ✓
A = \$1,958.43 for 30 years ✓

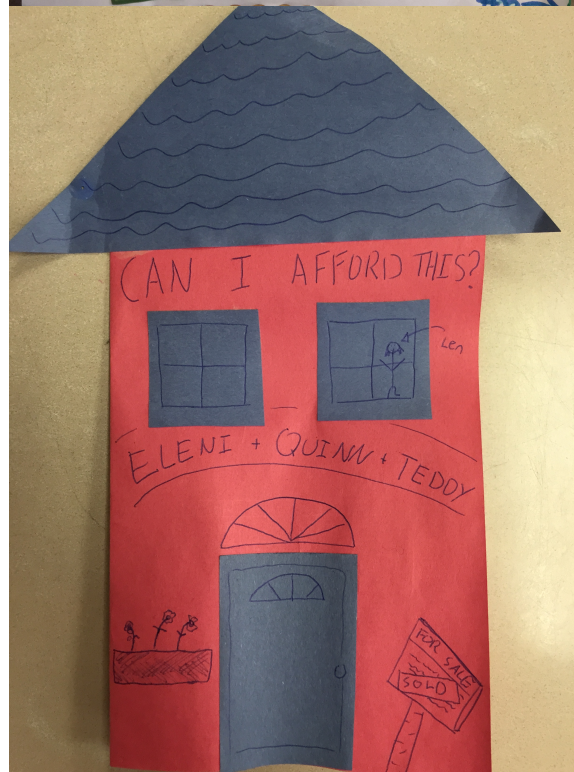
3) Minimum monthly salary needed to pay each mortgage:

- \$6,228.79 (15 yr. mortgage)
\$3,994.57 (30 yr. mortgage)
- \$4483.75 (15 yr. mortgage)
\$2,875.46 (30 yr. mortgage)
- \$9209.86 (15 yr. mortgage)
\$5,906.36 (30 yr. mortgage)
- \$10906.43 (15 yr. mortgage)
\$6,994.39 (30 yr. mortgage)

★ Raise! I now make \$82,000 a year.

4) Annuity Account-
To reach my goal of buying the \$300,000 home in 5 years, I must put aside \$2,086.58 in order to put down a 15% down payment. 8312.46

5) Can I afford the new home?
total mortgage = cost of home - down payment
 $= \$300,000 - \$45,000 = \$255,000$
New allowance for monthly mortgage = $255,000 \div 12 = \$21,250$
 $.28 \times \$6,833.33 = \$1,913.33$
- with my new salary, I can afford this home. This is because 28% of my monthly salary is enough to pay for the total mortgage.
(\$1,730.49 per month for 15 yrs.) (\$1,109.78 per month for 30 yrs.)



Appendix D-
Algebra II Tests/Quizzes

Test on Systems

Name _____

Date 12/12 Period 4

Find the inverse of each matrix. SHOW ALL STEPS.

$$1) \begin{bmatrix} 8 & 6 \\ -10 & -9 \end{bmatrix} = \frac{-72 - (-60)}{-12}$$

$$\frac{1}{-12} \begin{bmatrix} -9 & -6 \\ 10 & 8 \end{bmatrix} = \begin{bmatrix} \frac{3}{4} & \frac{1}{2} \\ -\frac{5}{6} & -\frac{2}{3} \end{bmatrix}$$

$$2) \begin{bmatrix} 11 & 1 \\ -6 & -10 \end{bmatrix} = \frac{-110 - (-6)}{-104}$$

$$\frac{1}{-104} \begin{bmatrix} -10 & -1 \\ 6 & 11 \end{bmatrix} = \begin{bmatrix} \frac{5}{52} & \frac{1}{104} \\ -\frac{3}{52} & -\frac{11}{104} \end{bmatrix}$$

$$3) \begin{bmatrix} 10 & 4 \\ 7 & 0 \end{bmatrix} = \frac{0 - 28}{-28}$$

$$\frac{1}{-28} \begin{bmatrix} 0 & -4 \\ -7 & 10 \end{bmatrix} = \begin{bmatrix} 0 & \frac{1}{7} \\ \frac{1}{4} & -\frac{5}{14} \end{bmatrix}$$

$$4) \begin{bmatrix} -5 & 4 & 2 \\ -2 & -6 & -1 \\ -3 & -4 & -1 \end{bmatrix} = \begin{bmatrix} -\frac{1}{13} & \frac{2}{13} & -\frac{4}{13} \\ -\frac{1}{26} & -\frac{1}{26} & \frac{5}{26} \\ \frac{5}{13} & \frac{14}{13} & -\frac{11}{13} \end{bmatrix}$$

Solve each system by using the inverse matrix. SHOW ALL STEPS.

$$5) \begin{cases} -3x + 5y = -5 \\ 7x - 5y = -15 \end{cases} \quad \begin{bmatrix} -3 & 5 \\ 7 & -5 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -5 \\ -15 \end{bmatrix}$$

$$\frac{1}{-20} \begin{bmatrix} -5 & -5 \\ -7 & -3 \end{bmatrix} = \begin{bmatrix} \frac{1}{4} & \frac{1}{4} \\ \frac{7}{20} & \frac{3}{20} \end{bmatrix} \cdot \begin{bmatrix} -5 \\ -15 \end{bmatrix} = \begin{bmatrix} -5 \\ -4 \end{bmatrix} = \begin{matrix} x \\ y \end{matrix}$$

$$-\frac{5}{4} + \frac{-15}{4} = \frac{-20}{4} = -5$$

$$\frac{-35}{20} + \frac{-45}{20} = \frac{-80}{20} = -4$$

$$\begin{aligned} -3(-5) + 5(-4) &= -5 \\ 15 + (-20) &= -5 \\ -5 &= -5 \end{aligned}$$

$$6) \begin{cases} -4x + 4y = -4 \\ -6x + 8y = -2 \end{cases} \quad \begin{bmatrix} -4 & 4 \\ -6 & 8 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -4 \\ -2 \end{bmatrix}$$

$$\frac{1}{-8} \begin{bmatrix} 8 & -4 \\ 6 & -4 \end{bmatrix} = \begin{bmatrix} -1 & \frac{1}{2} \\ \frac{3}{4} & \frac{1}{2} \end{bmatrix} \cdot \begin{bmatrix} -4 \\ -2 \end{bmatrix} =$$

$$4 + (-1) = 3$$

$$\frac{12}{4} + 1 = 3 - 1 = 2$$

$$8) \begin{cases} -3a - 4b - 6c = -9 \\ a + 2b + c = 8 \\ 2a + 5b - 2c = 26 \end{cases}$$

$$\begin{bmatrix} -3 & -4 & -6 \\ 1 & 2 & 1 \\ 2 & 5 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -9 \\ 8 \\ 26 \end{bmatrix}$$

$$\begin{bmatrix} -3 \\ 6 \\ -1 \end{bmatrix} = \begin{matrix} x \\ y \\ z \end{matrix}$$

$$\begin{bmatrix} 2 & 1 & 1 \\ 4 & -4 & 2 \\ 2 & 2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 17 \\ -12 \\ 3 \end{bmatrix}$$

$$x =$$

$$y =$$

$$z =$$

$$\det = 0$$

no solution

Solve each system of equations.

$$(4-y)(4-y)$$

$$16 - 4y - 4y + y^2$$

$$9) x^2 + y^2 + 4x - 16y + 64 = 0$$

$$x + y = 4$$

$$x = 4 - y$$

$$(4-y)^2 + y^2 + 4(4-y) - 16y + 64 = 0$$

$$y^2 + y^2 - 8y + 16 + 16 - 4y - 16y + 64 = 0$$

$$2y^2 - 28y + 96 = 0$$

$$y^2 - 14y + 48 = 0$$

$$x + 6 = 4$$

$$x = -2$$

$$x + 8 = 4$$

$$x = -4$$

$$(y-6)(y-8)$$

$$y = 6$$

$$y = 8$$

$$\boxed{\begin{matrix} (-2, 6) \\ (-4, 8) \end{matrix}}$$

$$11) x^2 + y^2 - 10x - 14y + 54 = 0$$

$$-x^2 + y^2 + 6x + 14y + 18 = 0$$

$$4x + 36 = 0$$

$$4x = -36$$

$$x = -9$$

$$-9^2 + y^2 - 6(-9) - 14y + 18 = 0$$

$$81 + y^2 + 54 - 14y + 18 = 0$$

$$y^2 - 14y + 153 = 0$$

$$-5(6)^2 +$$

$$-5(6)^2 + 5y^2 - 13(6) - 62 = 0$$

$$-180 + 5y^2 - 78 - 62 = 0$$

$$5y^2 - 320 = 0$$

$$y^2 - 64 = 0$$

$$y^2 = 64$$

$$(3x-1)(3x-1)$$

$$9x^2 - 3x - 3x + 1$$

$$5(9x^2 - 6x + 1)$$

$$45x^2 - 30x + 5$$

$$10) 3x^2 + 5y^2 - 123x + 3y + 94 = 0$$

$$3x - y = 1$$

$$-y = 1 + 3x$$

$$y = 3x - 1$$

$$3x^2 + 5(3x-1)^2 - 123x + 3(3x-1) + 94 = 0$$

$$3x^2 + 45x^2 - 30x + 5 - 123x + 9x - 3 + 94 = 0$$

$$48x^2 - 144x + 96 = 0$$

$$x^2 - 3x + 2 = 0$$

$$(x-2)(x-1) = 0$$

$$x = 2$$

$$x = 1$$

$$3(2) - y = 1$$

$$6 - y = 1$$

$$-y = -5$$

$$y = 5$$

$$3(1) - y = 1$$

$$3 - y = 1$$

$$-y = -2$$

$$y = 2$$

$$\boxed{\begin{matrix} (2, 5) \\ (1, 2) \end{matrix}}$$

$$12) -10x^2 + 5y^2 + 22x - 92 = 0$$

$$-5x^2 + 5y^2 - 13x - 62 = 0$$

$$-5x^2 + 35x - 30 = 0$$

$$x^2 - 7x + 6 = 0$$

$$(x-1)(x-6)$$

$$x = 1$$

$$x = 6$$

$$\boxed{\begin{matrix} (1, -4) \\ (1, 4) \\ (6, -8) \\ (6, 8) \end{matrix}}$$

$$-5(1)^2 + 5y^2 - 13(1) - 62 = 0$$

$$-5 + 5y^2 - 13 - 62 = 0$$

$$5y^2 - 80 = 0$$

$$y^2 - 16 = 0$$

$$\sqrt{y^2} = \sqrt{16}$$

$$y = \pm 4$$

100
102!

Name _____

Properties of Exponents and Radical Expressions Quiz Date 10/31 Period 4

Simplify. Your answer should contain only positive exponents.

$$1) \frac{(-yx^4)^6}{-x^0y^0 \cdot -x^{-5}y^6} = \frac{y^6 x^{24}}{x^{-5} y^6}$$

$y^0 x^{29}$ (x^{29}) ✓

$$2) \left(\frac{-yx^3 \cdot x^3 y^5}{y^{-5}} \right)^3 = \left(\frac{y^3 x^9 \cdot x^9 y^{15}}{y^{-15}} \right)^3 = \frac{y^{18} x^{18}}{y^{-15}}$$

$(-y^{33} x^{18})$ ✓

$$3) \frac{(-m^5)^3}{(-n^0 \cdot n^{-2})^2} = \frac{-m^{15}}{\frac{-n^0 \cdot n^{-4}}{-m^{15} n^{-4}}} = \frac{-m^{15} n^4}{-m^{15} n^4}$$

✓ $+m^{15} n^4 = \frac{+m^{15} n^4}{-m^{15} n^4}$ you're right!

$$4) \frac{x^2 y^{-5} \cdot -x^5 y^{-2}}{(x^{-5} y^{-1})^0} = \frac{-x^7 y^{-7}}{1} = \frac{-x^7}{y^7}$$

$(\frac{-x^7}{y^7})$ ✓

Rewrite in exponential form. SIMPLIFY!

$$5) \sqrt{75p^2} \quad 75p^{2/2} = 75p^1 = 75p \checkmark$$

$$6) \sqrt{125k} = (125k)^{1/2}$$

$\begin{matrix} \wedge \\ 5 \cdot 25 \\ \wedge \\ 5 \cdot 5 \end{matrix}$

$5\sqrt{5k}$ need parenthesis
-2

$$7) \sqrt{32m} \quad (32m)^{1/2}$$

$\begin{matrix} \wedge \\ 2 \cdot 16 \\ \wedge \\ 4 \cdot 4 \end{matrix}$ $4\sqrt{2m}$

Write each expression in radical form. SIMPLIFY!

$$8) (6n)^{2/3} \quad \sqrt[3]{(6n)^2} \checkmark$$

$$9) m^{1/2} \quad \sqrt{m} \checkmark$$

$$10) (7x)^{5/3} \quad \sqrt[3]{(7x)^5} \checkmark$$

$7x \sqrt[3]{(7x)^2}$

()

Solve using a calculator. Round your answers to the nearest HUNDREDTH!

11) $5\sqrt{490}$ $5(490)^{1/2}$

$5(22.136)$

110.68

12) $-4\sqrt[3]{896}$ $-4(896)^{1/3}$

$-4(2.64)$

-10.56

13) $-4\sqrt[3]{-500}$

$-4(-500)^{1/3}$

$-4(-7.94)$

31.75

+

Solve each radical expression.

Bonus +2

14.) $(\sqrt{x+2}+1)^2 = (\sqrt{3-x})^2$

$x+2+2\sqrt{x+2}+1 = 3-x$

$x+3+2\sqrt{x+2} = 3-x$

$2\sqrt{x+2} = -2x$

$\sqrt{x+2} = -x$

$x+2 = x^2$

$x^2-x-2 = 0$

$(x-2)(x+1) = 0$

$x = 2$

$x = -1$

Yes! Awesome

15.) $(x+2)^{3/4} - 1 = 7$

$(x+2)^{3/4} = 8$

$x+2 = 16$

$x = 14$

Chapter 4 Test

Name _____

Date 10/24 Period 4

(96)

Simplify.

1) $(7-8i)^2 (7-8i)(7-8i)$

$$49 - 56i - 56i + 64i^2$$

$$49 - 112i - 64$$

$$-15 - 112i$$



2) $\frac{3i}{6-3i} \cdot \frac{6+3i}{6+3i} = \frac{18i + 9i^2}{36 - 9i^2} = \frac{18i + 9(-1)}{36 - 9(-1)}$

$$\frac{18i - 9}{36 + 9} = \frac{18i - 9}{45} = \frac{\overset{2}{\cancel{18}i} - 1}{5}$$

-2

Solve each equation by completing the square.

3) $9x^2 + 18x - 37 = -10$ $b = \frac{2}{2} = 1^2 = 1$

$$\frac{9x^2}{9} + \frac{18x}{9} = \frac{27}{9}$$

$$x^2 + 2x + \underline{1} = 3 + 1$$

$$x^2 + 2x + 1 = 4$$

$$\sqrt{(x+1)^2} = \sqrt{4}$$

$$\begin{array}{r} x+1 = \pm 2 \\ -1 \quad -1 \end{array}$$

$$x = -1 \pm 2$$

$$x = -3, x = 1$$



4) $x^2 + 4x + 22 = -10$ $b = \frac{4}{2} = 2^2 = 4$

$$x^2 + 4x + \underline{4} = -22 + 4$$

$$x^2 + 4x + 4 = -18$$

$$\sqrt{(x+2)^2} = \sqrt{16}$$

$$\begin{array}{r} x+2 = \pm 4 \\ -2 \quad -2 \end{array}$$

$$x = -2 \pm 4$$

$$x = -6, x = 2$$

-3

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Solve each equation with the quadratic formula.

5) $6b^2 - 5 = -b$ $6b^2 + b - 5 = 0$ $a=6$
 $b=1$
 $c=-5$

$$x = \frac{-1 \pm \sqrt{1^2 - 4(6)(-5)}}{2(6)}$$

$$x = \frac{-1 \pm \sqrt{1 + 120}}{12}$$

$$x = \frac{-1 \pm \sqrt{121}}{12} = \frac{-1 \pm 11}{12}$$

$$x = \frac{5}{6}, x = -1$$

6) $2x^2 + 9 = 11x$ $2x^2 - 11x + 9 = 0$ $a=2$
 $b=-11$
 $c=9$

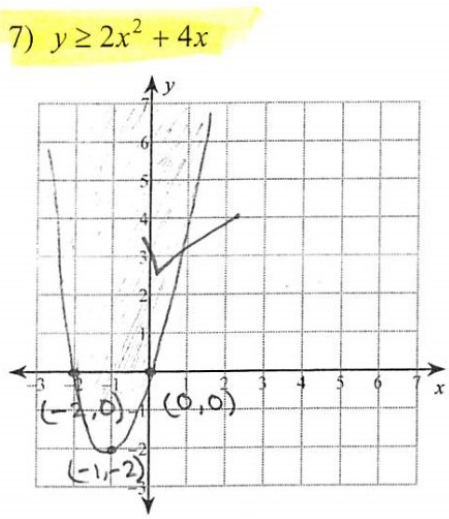
$$x = \frac{11 \pm \sqrt{(-11)^2 - 4(2)(9)}}{2(2)}$$

$$x = \frac{11 \pm \sqrt{121 - 72}}{4}$$

$$x = \frac{11 \pm \sqrt{49}}{4} = \frac{11 \pm 7}{4}$$

$$x = 1, x = \frac{9}{2}$$

Sketch the graph of each function, label your x-intercepts and shade appropriately.



$$y \geq 2x^2 + 4x$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-4 \pm \sqrt{4^2 - 4(2)(0)}}{2(2)}$$

$$x = \frac{-4 \pm \sqrt{16}}{4} = \frac{-4 \pm 4}{4}$$

$$x = -2, x = 0$$

x-intercepts
 $(0, 0)$
 $(-2, 0)$

$$y \geq 2x^2 + 4x$$

$$0 \geq 2(1)^2 + 4(1)$$

$$0 \geq 2 + 4$$

$$0 \geq 6$$

X

vertex

$$x = \frac{-b}{2a} = \frac{-4}{2(2)} = \frac{-4}{4} = -1$$

$$y = 2x^2 + 4x$$

$$= 2(-1)^2 + 4(-1)$$

$$= 2 - 4$$

$$y = -2$$

vertex = $(-1, -2)$

Appendix E-
Pre- Calculus Tests/Quizzes

Pre-Calculus $\sin = \frac{y}{r}$ $\cos = \frac{x}{r}$ $\tan = \frac{y}{x}$ $\csc = \frac{1}{\sin}$ $\sec = \frac{1}{\cos}$ $\cot = \frac{1}{\tan}$

100

Quiz on Trigonometric Functions

Date 12/19/14 Period 3

Find the exact value of each trigonometric function.

1) $\cos \frac{3\pi}{2} = 0$

2) $\sin -\frac{\pi}{2} = -1$

3) $\tan -\frac{2\pi}{3} = -\frac{\sqrt{3}}{2} \cdot -\frac{2}{1} = \sqrt{3}$

4) $\tan \frac{5\pi}{3} = \frac{-\sqrt{3}}{\sqrt{2}} \cdot \frac{2}{1} = -\sqrt{3}$

Find the exact value of each trigonometric function by first finding the mixed number, then solve.

5) $\sin \frac{14\pi}{3} = \sin 4\frac{2\pi}{3} = \frac{\sqrt{3}}{2}$

6) $\tan \frac{23\pi}{4} = \tan 5\frac{3\pi}{4} = \frac{-\sqrt{2}}{2} \cdot \frac{1}{\sqrt{2}} = -1$

Find the exact value of each trigonometric function.

7) $\csc \frac{7\pi}{4} = \frac{1}{\sin \frac{7\pi}{4}} = \frac{1}{-\frac{\sqrt{2}}{2}} = -\sqrt{2}$

8) $\csc \frac{\pi}{3} = \frac{1}{\sin \frac{\pi}{3}} = \frac{1}{\frac{\sqrt{3}}{2}} = \frac{2\sqrt{3}}{3}$

9) $\cot -\frac{5\pi}{4} = \frac{\cos}{\sin} = \frac{-\frac{\sqrt{2}}{2}}{\frac{2}{\sqrt{2}}} = -1$

10) $\sec -\frac{\pi}{2} = \frac{1}{\cos -\frac{\pi}{2}} = \frac{1}{0} = \text{Undefined}$

Find the exact value of each trigonometric function, first by finding the mixed number, then solve.

11) $\csc \frac{29\pi}{6} = \csc 4\frac{5\pi}{6} = \frac{1}{\sin \frac{5\pi}{6}} = \frac{1}{\frac{1}{2}} = 2$

12) $\cot \frac{13\pi}{3} = \cot 4\frac{\pi}{3} = \frac{\cos}{\sin} = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}}$

Just Coordinates and Radians

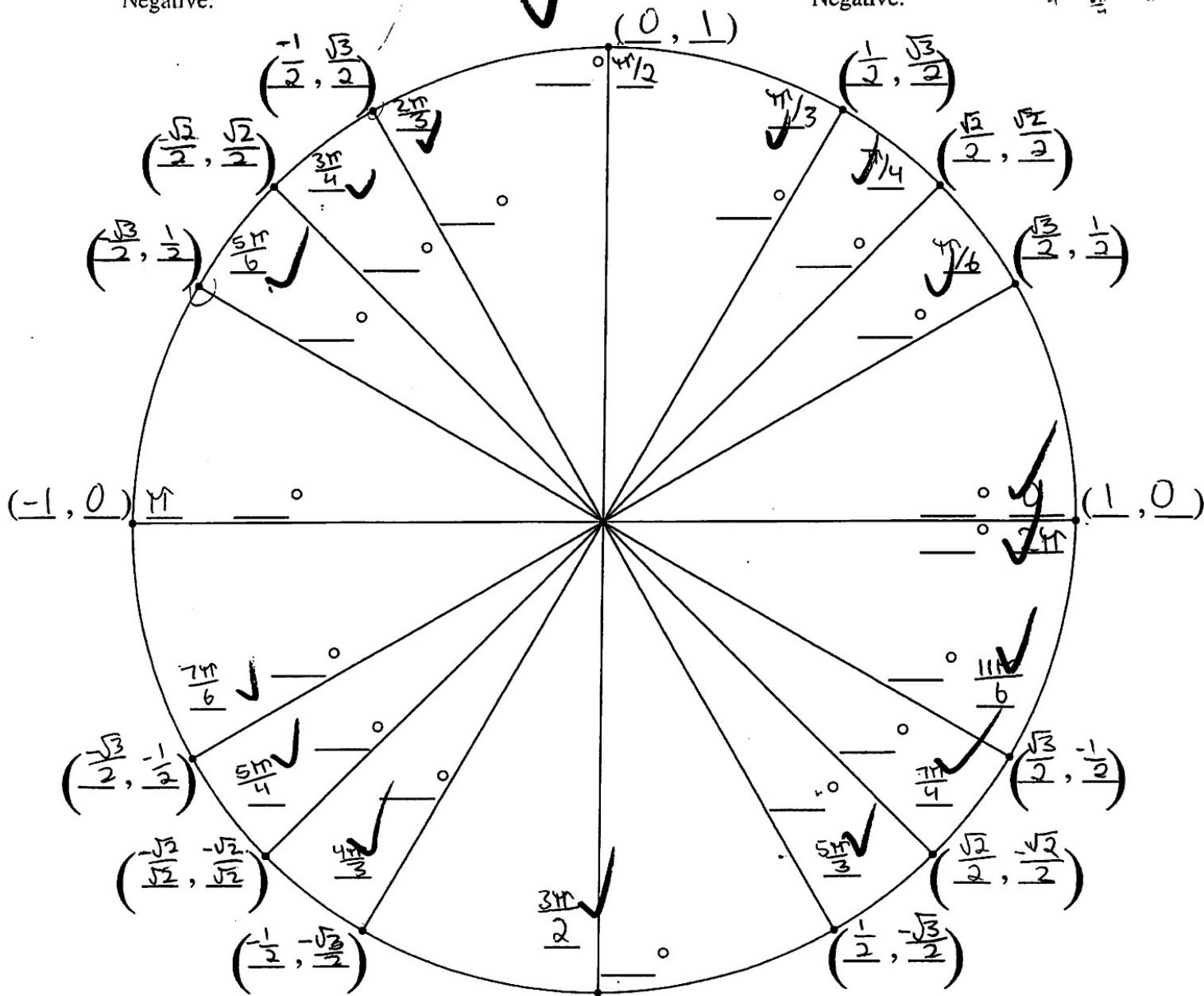
NOT Degrees

Fill in The Unit Circle



Positive:
Negative:

Positive:
Negative:



Positive:
Negative:

$$\frac{8\pi}{6} = \frac{4\pi}{3}$$

$$\frac{10\pi}{6} = \frac{5\pi}{3}$$

Positive:
Negative:

Test on Chapter 3 Logarithms

Name _____

Date 12/12/14 Period 3

Rewrite each equation in exponential form.

$$1) \log_7 \frac{1}{49} = -2$$

$$7^{-2} = \frac{1}{49}$$

$$2) \log_{15} 225 = 2$$

$$15^2 = 225$$

Fav. 800 240 0201

Rewrite each equation in logarithmic form.

$$3) 3^4 = 81$$

$$\log_3 81 = 4$$

$$4) 11^2 = 121$$

$$\log_{11} 121 = 2$$

Use a calculator to approximate each to the nearest thousandth.

$$5) \log_2 42 = \frac{\log 42}{\log 2}$$

$$= 5.392$$

$$6) \log_6 5.5 = \frac{\log 5.5}{\log 6}$$

$$= .951$$

Condense each expression to a single logarithm.

$$7) 9 \log_6 u + 3 \log_6 v$$

$$= \log_6 u^9 + \log_6 v^3$$

$$= \log_6 u^9 v^3$$

$$8) 6 \log_7 5 + \frac{\log_7 2}{3}$$

$$= \log_7 5^6 + \log_7 \sqrt[3]{2}$$

$$= \log_7 15625 \sqrt[3]{2}$$

Expand each logarithm.

$$9) \log_6 \left(\frac{x}{y^5} \right)$$

$$= \log_6 x - \log_6 y^5$$

$$= 5 \log_6 x - 25 \log_6 y$$

$$10) \log_5 (3^4 \sqrt{8})$$

$$= \log_5 3^4 + \log_5 \sqrt{8}$$

$$= \frac{4 \log_3 3 + \log_5 8}{4 \log_5 3 + 2}$$

Solve each equation.

$$11) \frac{-10 \ln 5n}{-10} = \frac{0}{-10}$$

$$\ln 5n = 0$$

$$e^{\ln 5n} = e^0$$

$$\frac{5n}{5} = \frac{1}{5}$$

$$n = 1/5$$

$$13) \frac{2 \log_7 4b}{2} = \frac{-4}{2}$$

$$\log_7 4b = -2$$

$$7^{\log_7 4b} = 7^{-2}$$

$$\frac{4b}{4} = \frac{1}{49}$$

$$b = \frac{1}{196}$$

$$15) \log_8 (x-3) + \log_8 6 = \log_8 4$$

$$\log_8 6(x-3) = \log_8 4$$

$$6(x-3) = 4$$

$$6x - 18 = 4$$

$$\frac{6x}{6} = \frac{22}{6} \quad \left| x = \frac{22}{6} \text{ or } 3.667 \right|$$

$$17) \frac{5 + 2 \ln x}{-5} = \frac{4}{-5}$$

$$\frac{2 \ln x}{2} = \frac{-1}{2}$$

$$\ln x = -\frac{1}{2}$$

$$e^{\ln x} = e^{-1/2}$$

$$x = e^{-1/2} = 0.607$$

$$19) \frac{18 = 2 \cdot 3^x - 10}{+10} = \frac{+10}{+10}$$

$$\frac{28 = 2 \cdot 3^x}{2} = \frac{20}{2}$$

$$14 = 3^x$$

$$\log_3 14 = \log_3 3^x$$

$$1.11 - x = 2.402$$

$$12) \frac{7 + \log_{11} (x+3)}{-7} = \frac{6}{-7}$$

$$\log_{11} (x+3) = -1$$

$$11^{\log_{11} (x+3)} = 11^{-1}$$

$$x+3 = \frac{1}{11}$$

$$x = \frac{-32}{11}$$

$$14) \log_3 (r+4) - 6 = -4$$

$$\log_3 (r+4) = 2$$

$$3^{\log_3 (r+4)} = 3^2$$

$$r+4 = 9$$

$$r = 5$$

$$16) \log_6 (x+4) - \log_6 5 = 1$$

$$\log_6 \frac{(x+4)}{5} = 1$$

$$\frac{x+4}{5} = 6$$

$$5 \cdot \frac{x+4}{5} = 6 \cdot 5$$

$$x+4 = 30$$

$$18) \frac{32 = 4^{2x-1} - 2}{+2} = \frac{+2}{+2}$$

$$34 = 4^{2x-1}$$

$$\log_4 34 = \log_4 4^{2x-1}$$

$$\frac{\log_4 34}{2} = \frac{2x-1}{2}$$

$$x = \frac{1}{2}(\log_4 34 + 1)$$

$$20) y = e^{2x} - 2e^x - 8$$

$$0 = (e^x - 4)(e^x + 2)$$

$$e^x - 4 = 0$$

$$e^x = 4$$

$$x = \ln 4$$

$$e^x + 2 = 0$$

$$e^x = -2$$

$$\ln e^x = \ln -2$$

$$x = \ln -2$$

Not an answer because can't have

Test Chapter 2 Part 2

92

Name _____

Date 11/7/14 367 Plantation Street Period 3

15

Simplify

$$1) 2 - (7 - 3i) - (7 + 7i)$$

$$= 2 - 7 + 3i - 7 - 7i$$

$$= -5 + 3i - 7 - 7i$$

$$= -12 - 4i$$

-1

$4(-3 - i)$ Reduced \leftarrow only when you can cancel

$$2) (-2 + 3i) + (-4 + 5i) + 5i$$

$$= -2 + 3i - 4 + 5i + 5i$$

$$= -6 + 8i + 5i$$

$$= -1 + 8i$$

$$3) (-5i)(i) - 5(5 + 7i)$$

$$= -5i^2 - 25 - 35i$$

$$= -5(-1) - 25 - 35i$$

$$= 5 - 25 - 35i$$

$$= -20 - 35i$$

$$= 5(-4 - 7i)$$

-1

$$4) (2 + 4i)(4 - i)$$

$$= 8 - 2i + 16i - 4i^2$$

$$= 8 + 14i - 4(-1)$$

$$= 8 + 4 + 14i$$

$$= 12 + 14i$$

$$= 2(6 + 7i)$$

$$\begin{array}{r} 45 \\ 24 \\ \hline 21 \\ 25 \\ 16 \\ \hline 41 \end{array}$$

$$\frac{27}{9} = 3$$

$$5) \frac{9 - 10i}{5i} \cdot \frac{5i}{5i} = \frac{45i - 50i^2}{25i^2}$$

$$= \frac{45i + 50}{-25} = \frac{9i + 10}{-5}$$

Reduced yes!

$$\frac{1}{5} \frac{9i + 10}{-25} = \frac{9i + 10}{-125}$$

$$6) \frac{9 + 6i}{-4 - 5i} \cdot \frac{-4 + 5i}{-4 + 5i} = \frac{-36 - 24i + 45i + 30i^2}{16 + 20i - 20i - 25i^2}$$

$$= \frac{36 + 21i - 30}{16 + 25} = \frac{-66 + 21i}{41}$$

-1

Find ALL asymptotes as well as any holes.

$$7) f(x) = \frac{x}{4x^2 + 12x} = \frac{x}{4x(x + 3)}$$

Horizontal: $y = 0$ ✓
 Vertical: $x = -3$ ✓
 NO HOLE $x = 0$
 NO Slant

-1

$$8) f(x) = \frac{x - 4}{-4x + 12} = \frac{x - 4}{-4(x - 3)}$$

Horizontal: $y = -\frac{1}{4}$ ✓
 Vertical: $x = 3$ ✓
 HOLE: No Hole
 NO Slant

(-5)

$$9) f(x) = \frac{x^2 - 16}{x^2 - x - 12} = \frac{(x+4)(x-4)}{(x-4)(x+3)}$$

Horizontal: $y = 1$ ✓
 Vertical: $x = -3$ ✓
 Hole: $x = 4$ ✓
 No Slant Asymptote

$$10) f(x) = -\frac{3x^0}{x^2 - 3x} = \frac{3}{x(x-3)}$$

Horizontal: $y = 0$ ✓
 Vertical: $x = 3, 0$
 NO HOLE
 No Slant Asymptote

$$11) f(x) = \frac{-4x - 8}{x^2 - 2x - 8} = \frac{-4(x+2)}{(x-4)(x+2)}$$

Horizontal: $y = 0$ ✓
 Vertical: $x = 4$ ✓
 Hole: $x = -2$ ✓
 No Slant Asymptote

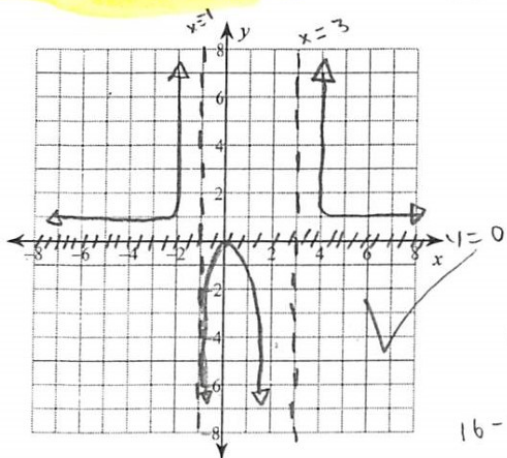
$$12) f(x) = \frac{-x^2 - x + 12}{x^2 - 4} = \frac{(-x+3)(x+4)}{(x+2)(x-2)}$$

Horizontal: $y = -1$ ✓
 Vertical: $x = \pm 2$ NO slant Asymptote
 Hole: $x = -2$

$$\begin{aligned} &(-x+3)(x+4) \\ &= -x^2 - 4x + 3x + 12 \\ &= -x^2 - x + 12 \end{aligned}$$

Identify the holes, if any, and ALL asymptotes. Then sketch the graph.

$$13) f(x) = \frac{1x^0}{x^2 - 2x - 3} = \frac{1}{(x+1)(x-3)}$$



Horizontal: $y = 0$
 Vertical: $x = -1, 3$

No Hole

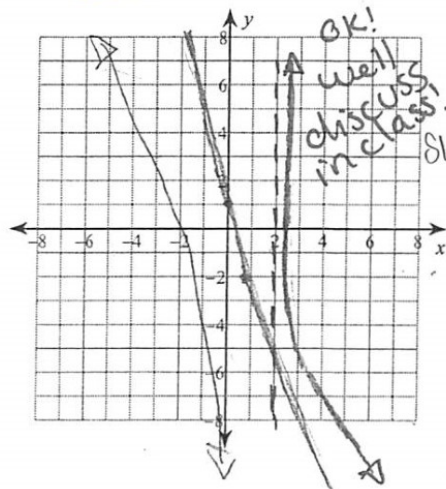
No Slant Asymptote

$$\begin{aligned} &x^2 - 3x + 1x - 3 \\ &x^2 - 2x - 3 \end{aligned}$$

$$\frac{1}{4} \div \frac{1}{11} = \frac{2}{7} \div \frac{1}{4} = 3$$

$$\frac{1}{1/4 - 2(-5) - 3} = \frac{1}{16 - 10 - 3} = \frac{1}{3}$$

$$14) f(x) = \frac{x^2 + 2x}{4x - 8} = \frac{x^2 + 2x}{4(x-2)}$$



NO Horizontal

Vertical: $x = 2$
 NO HOLE

$$\text{Slant: } y = \frac{1}{4}x + 1 - \frac{8}{4x-8}$$

$$-2 \times \frac{1}{4} - \frac{2}{4} = -\frac{1}{2} - \frac{1}{2} = -1$$

$$16 + 8 = 24$$

$$\frac{4^2 + 2(4)}{4(4) - 8} = \frac{24}{8} = 3$$

$$\begin{array}{r} \frac{1}{4}x + 1 - \frac{8}{4x-8} \\ 4x-8 \sqrt{x^2 + 2x} \\ \underline{-x^2 + 2x} \\ 0 \quad 4x - 8 \\ \underline{-4x} \\ 4x - 8 \end{array}$$

-3

Quiz

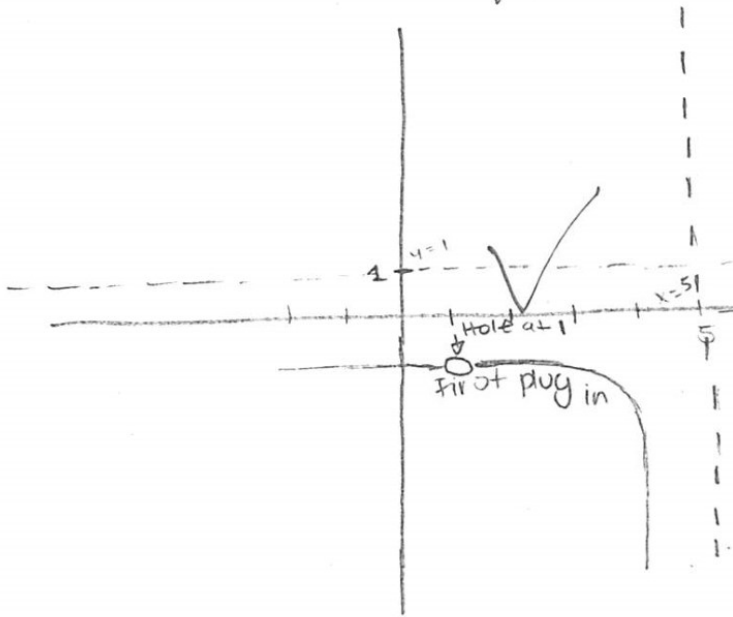
SHORT ANSWER.

Find the horizontal & vertical asymptotes, if any, as well as any holes of the graph of the rational function. Please **GRAPH!**

$$1) g(x) = \frac{x^2 + 3x - 4}{x^2 - 6x + 5} = \frac{(x+4)(x-1)}{(x-5)(x-1)}$$

Horizontal = $y = 1$ ✓
 Vertical = $x = 5$ ✓
 Hole = $x = 1$ ✓

AWESOME!



second plug in

$$= \frac{2^2 + 3(2) - 4}{2^2 - 6(2) + 5}$$

$$= \frac{11 + 6 - 4}{4 - 12 + 5}$$

$$= \frac{10 - 4}{-8 + 5} = \frac{6}{-3} = -2$$

$$= \frac{7^2 + 3(7) - 4}{7^2 - 6(7) + 5}$$

$$= \frac{49 + 21 - 4}{49 - 42 - 4}$$

$$= \frac{70 - 4}{7 - 4} = \frac{66}{3}$$

$$= 22$$

$$\begin{array}{r} 36 \\ 6 \\ \hline 42 \end{array}$$

$$\begin{array}{r} 49 \\ 21 \\ \hline 70 \end{array}$$

$$\begin{array}{r} 49 \\ -42 \\ \hline 7 \end{array}$$

$$3 \overline{) 66}$$

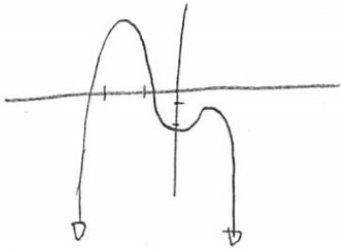
Chapter 2 Part 1 Test

Name _____

Date 10/24/14 Period 3

Approximate each zero to the nearest hundredth.

1) $f(x) = -x^4 + 4x^2 - 3x - 2$



$x = -0.43$

$x = -2.22$

✓

2) $f(x) = -2x^2 + 4x + 4$



$x = -0.73$

$x = 2.73$

✓

Divide by synthetic division.

3) $(x^3 - 20x^2 + 97x + 34) \div (x - 10)$

$$\begin{array}{r|rrrr} 10 & 1 & -20 & 97 & 34 \\ & & 10 & -100 & -30 \\ \hline & 1 & -10 & -3 & 4 \end{array}$$

$$\text{Answer} = x^2 - 10x - 3 + \frac{4}{x-10}$$

4) $(40k^3 + 24k^2 - 9) \div (10k + 6)$

$$\begin{array}{r|rrrr} -\frac{6}{10} & 40 & 24 & 0 & -9 \\ & & -24 & 0 & 0 \\ \hline & 40 & 0 & 0 & -9 \end{array}$$

$$40k^2 - \frac{9}{10k+6} = \text{Answer}$$

Divide by long division.

5) $\frac{10a^3 - 54a^2 + 24a + 44}{10a + 6}$

$$\begin{array}{r}
 a^2 - 6a + 6 \\
 10a + 6 \overline{) 10a^3 - 54a^2 + 24a + 44} \\
 \underline{-(10a^3 + 6a^2)} \\
 0 - 60a^2 + 24a \\
 \underline{-(-60a^2 - 36a)} \\
 0 60a^2 + 36a \\
 \underline{-(60a + 36)} \\
 -60a - 36 \\
 \underline{ - 36} \\
 0 8
 \end{array}$$

✓

$$\text{Answer} = a^2 - 6a + 6 + \frac{8}{10a + 6}$$

$$\begin{array}{r}
 m^3 - 8m^2 - 3m + 3 \\
 5m + 4 \overline{) 5m^4 - 36m^3 - 47m^2 + 3m + 10} \\
 \underline{-5m^4 - 4m^3} \\
 0 - 40m^3 - 47m^2 \\
 \underline{+ 40m^3 + 32m^2} \\
 -15m^2 + 3m \\
 \underline{+ 15m^2 + 12m} \\
 15m + 10 \\
 \underline{-15m - 12} \\
 0 -2
 \end{array}$$

✓

$$\text{Answer} = m^3 - 8m^2 - 3m + 3 - \frac{2}{5m + 4}$$

BONUS: BECAUSE HE HAS EBOLA.

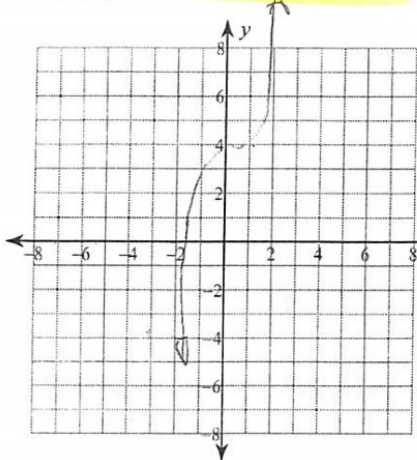
+1 for creativity 😊

Quiz *CALCULATOR*

Date 10/7/14 Period 3

Sketch the graph of each function and find the x-intercepts. Round to the nearest hundredth.

1) $f(x) = x^5 - 3x^3 + 2x + 4$



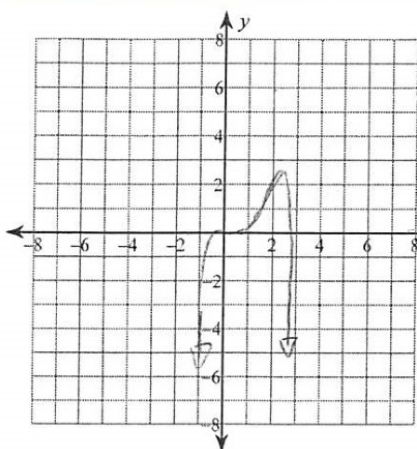
$x = -1.757633$

$x = -1.76$

$(-1.76, 0)$

1 zero

2) $f(x) = -x^4 + 2x^3 + x^2$



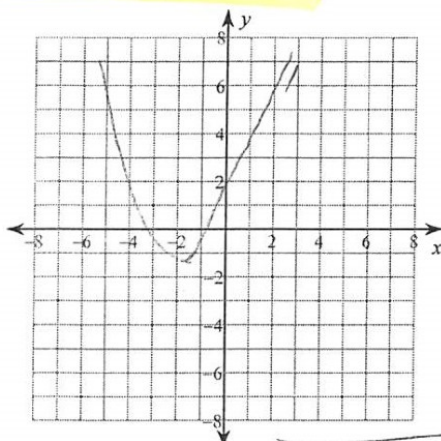
$x = 0$

$x = -0.41$

$x = 2.41$

3 zeros

3) $f(x) = x^2 + 4x + 2$

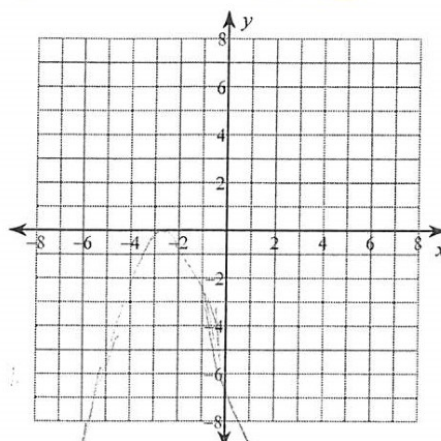


$x = -0.59$

$x = -3.41$

2 zeros

4) $f(x) = -x^2 - 8x - 16$



1 zero

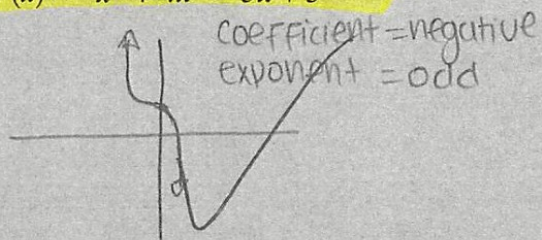
$x = -4.00$

Quiz *NO CALCULATOR*

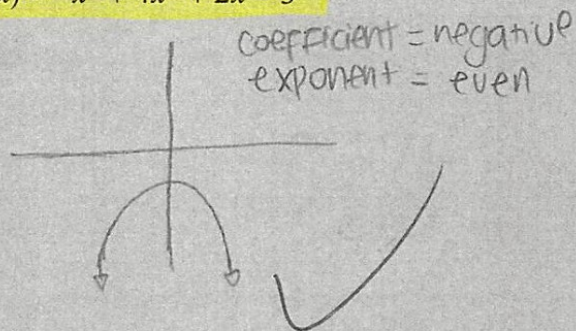
Date 10/17/14 Period 3

Sketch the general shape of each function.

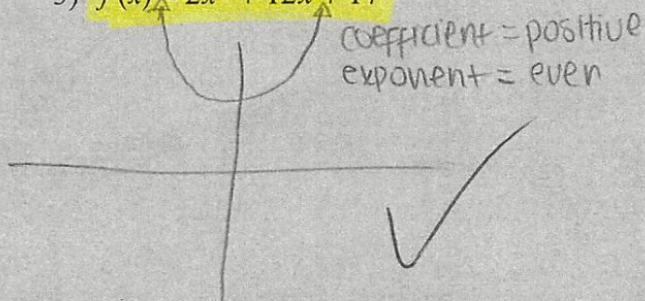
1) $f(x) = -x^5 + 4x^3 - 5x + 3$



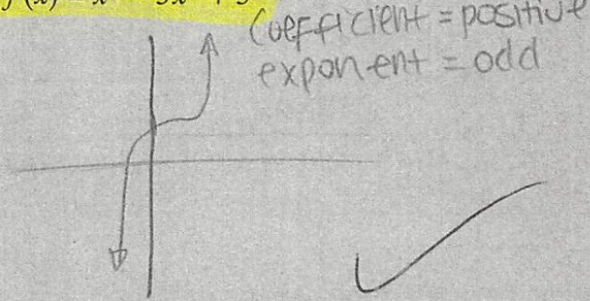
2) $f(x) = -x^4 + 4x^2 + 2x - 3$



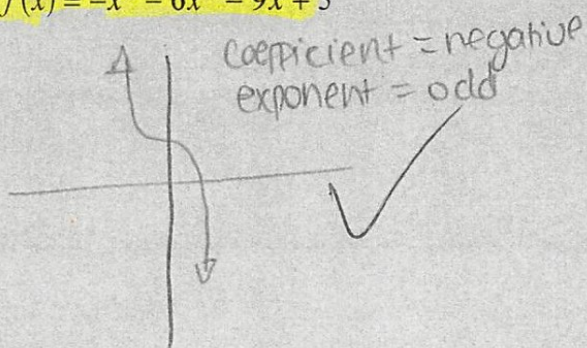
3) $f(x) = 2x^2 + 12x + 17$



4) $f(x) = x^3 - 3x^2 + 5$



5) $f(x) = -x^3 - 6x^2 - 9x + 3$



great job!

