FACULTY OF SCIENCE

UNIVERSITY OF JOHANNESBURG

DEPARTMENT OF MATHEMATICS

MODULE **MAT2T1A**
MATHEMATICS FOR TEACHERS 2

CAMPUS **APK**

EXAMINATION JUNE 2014

DATE: 18 JUNE 2014 **SESSION:** 08:30 – 09:30

ASSESSOR: **MR. T. MOHUBEDU**

INTERNAL MODERATOR: **MS. R. RICHARDSON**

DURATION: 2 HOURS **MARKS: 100**

SURNAME AND INITIALS _____

STUDENT NUMBER _____

CONTACT NUMBER _____

NUMBER OF PAGES: 16 PAGES (including front page**)**

INSTRUCTIONS: ANSWER ALL THE QUESTIONS ON THE PAPER IN PEN
SHOW ALL CALCULATIONS
CALCULATORS ARE NOT ALLOWED**.**

Question 1 [10]

Determine whether the following statements are true or false. If false, explain why or give an example

Statement / *Bewering*	**True or False & Explanation**
$(x-y)^3 = x^3 + 3xy - y^3$	
$y = x^2$ is symmetrical with respect to the $x-axis$.	
The relation $x^2 - y = 4$ represents y as a function of x	
The point (x, y) such that $\boldsymbol{x > 0}$ and $\boldsymbol{-y > 0}$ lies in the fourth quadrant.	
The range of the function is the set of all real numbers. $$\boldsymbol{f(x) = \frac{1}{x}}$$	

Question 2 [13]

Perform the indicated operations and simplify.

2.1 $\sqrt{98}+\sqrt{32}$ [2]

2.2 $(y+\sqrt{2})(y-\sqrt{2})$ [2]

2.3 $\frac{3}{4}-1\frac{1}{3}+2\frac{1}{2}$ [3]

2.4 $\dfrac{x^2-4}{x^3-8} \div \dfrac{3x}{2x^3+4x^2+8x}$ [3]

2.5 $\dfrac{1}{(x+1)^2} - \dfrac{1}{x^2-1}$ [3]

Question 3 [20]

3.1 Find the domain of the expression [2]

$$\frac{x}{\sqrt{x-4}}$$

3.2 Simplify and write your final answer without positive exponents. [3]

$$\left(\frac{3x^2y^3}{y^3}\right)^{-1}\left(\frac{9y^2}{x^{-2}}\right)$$

3.3 Factorise the expression $4x^2 - 13x - 12$. [2]

3.4 Factorise the expression $2(x+2)(x-1)^2-(x+2)^2(x-1)$ [3]

3.5 Determine if the function $f(x)=2x-x^3$ is odd, even or neither. [3]

3.6 Solve the inequality and represent your answer on a number line. [3]

$$1 \leq 3x-2 < 5$$

3.7 Given $x^2 - xy = y^2$

3.7.1 Test for symmetry with respect to the $x - axis$ [2]

3.7.2 Test for symmetry with respect to the origin [2]

Question 4 [22]

4.1 Solve the equation by factoring. [3]

$$3x(x + 4) = 9 - x(x - 3)$$

4.2 Solve the equation by the method of completing the square. [4]

$$2x^2 + 5x + 3 = 0$$

4.3 Solve for x:

4.3.1 $x^2 - 4 \geq 0$ [3]

4.3.2 $\sqrt{2x+3}-2=x$ [4]

4.3.3 $\dfrac{x-3}{x^2+3x+2}-\dfrac{5}{x^2-4}+\dfrac{4}{x+1}=0$ [4]

4.3.4 $\dfrac{x+1}{x+3} < \dfrac{x-2}{x-1}$ [4]

Question 5 [14]

5.1 Show that the points $A\,(-2,9)$, $C\,(1,0)$ and $D\,(-5,3)$ are vertices of a right triangle. [3]

5.2 Given the points $A\left(\frac{2}{3},\ -1\right)$ and $B\left(2,\ -\frac{3}{2}\right)$

5.2.1 Find the midpoint of AB [2]

5.2.2 Find the gradient of the line joining A and B. [2]

5.3 Determine the equation of a circle with centre $(-1, 5)$ and passes through the point $(-4, 6)$. [3]

5.4 Determine the equation of the straight line through the point $(-1, 2)$ that is perpendicular to the line $y = 3 - 2x$. [4]

Question 6 [8]

6.1 Sketch the graph of the straight line $3x + 2y - 6 = 0$ [3]

6.2 Given $f(x) = \begin{cases} 1 & x < -1 \\ x^2 & -1 \leq x < 1 \\ -\sqrt{x+1} & x \geq 1 \end{cases}$

6.2.1 Sketch the graph of the piece-wise function f [4]

6.2.2 Determine $f(-2)$ [1]

Question 7 [13]

7.1 Given $f(x) = -x^2 + x + 2$

7.1.1 Express f in the form $f(x) = a(x-h)^2 + k$ [3]

7.1.2 Determine the $x-$ intercepts ans the $y-$intercpept [2]

7.1.3. Sketch the graph of f [2]

7.1.4 State the range of f [1]

7.1.5 Give the intervals of increase and decrease. [2]

7.2 Describe the transformations of $y = -|x + 2| + 1$ with respect to the parent function $y = |x|$. [3]