FACULTY OF SCIENCE



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 $x > 0$ and $-y > 0$ lies in the fourth quadrant.	
The range of the function is the set of all real numbers. $f(x) = \frac{1}{x}$	

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]

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

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

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

Question 3 [20]

3.1	:		J :	- E LL-	expression
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[2]

[3]

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

3.2 Simplify and write your final answer without positive exponents.

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

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

[2]

2 4	Factoriae th	e expression
14	Factorise in	e expression

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]

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

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

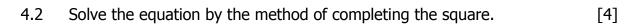
3.7.1 Test for symmetry with respect to the x - axis [2]

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

Question 4 [22]

4.1 Solve the equation by factoring. [3]

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



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

4.3 Solve for x:

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

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

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

4.3.4
$$\frac{x+1}{x+3} < \frac{x-2}{x-1}$$
 [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).

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
$$f(x) = \begin{cases} 1 & x < -1 \\ x^2 & -1 \le x < 1 \\ -\sqrt{x+1} & x \ge 1 \end{cases}$$

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 and the y –intercept [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]