MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2017/2018

PMT0101 – MATHEMATICS I

(All sections / Groups)

4 JUNE 2018
9:00 a.m. – 11:00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of six pages with **FIVE** questions.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the answer booklet provided.

4. **No calculators are allowed**.

5. **You are required to write proper steps.**

ANSWER ALL QUESTIONS.

QUESTION 1 [10 marks]

a) Simplify the following expression and write your final answer with no negative exponents. Assume that all variables have positive values. Show proper steps.

$$\frac{x^3(xy)^{-4}z^{-3}}{x^{-3}yz^{-2}}$$ [2 marks]

b) Simplify the radicals and write the final answer as a single term.

$$\sqrt{75}-\sqrt{972}$$ [2 marks]

c) Simplify the following expression. Write your final expression as a single fraction.

$$\frac{x^2-4}{3x^2-9x} \div \frac{x^2+x-6}{x^2-9}$$ [3 marks]

d) Express the following in the form $a+bi$ where a and b are real numbers.

$$\frac{1}{2-i}+\frac{1}{1+2i}$$ [3 marks]

Continued …….

QUESTION 2 [10 marks]

a) Solve the equation $|5x + 11| = 41$. [2 marks]

b) Solve the equation $\sqrt{15 - 3x} = 1 + x$. Remember to check your answers. [3 marks]

c) (i) Solve the quadratic equation $x^2 + 4x - 5 = 0$.

(ii) Solve the inequality $\frac{x^2+4x-5}{x+3} > 0$.
Give your final answer in interval notation.

(iii) Find the domain of the function $f(x) = \sqrt{\frac{x^2+4x-5}{x+3}}$.
Give your final answer in interval notation.

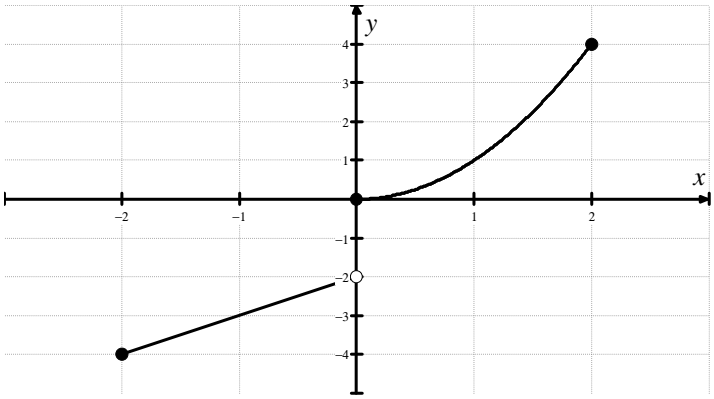
[5 marks]

Continued …….

QUESTION 3 [10 marks]

a) The following figure shows the graph of the function

$$f(x) = \begin{cases} x - 2 & \text{if} -2 \leq x < 0 \\ x^2 & \text{if} \quad 0 \leq x \leq 2 \end{cases},$$



(i) State the domain and range in interval notation.
(ii) State whether the function f is a one-to-one function.

[2 marks]

b) Given the functions $f(x) = \sqrt{x+3}$ and $g(x) = \dfrac{3}{x^2-5}$, find

(i) $(f \circ g)(1)$, giving your final answer in the form $\dfrac{m}{n}$ where m and n are integers.

(ii) $f^{-1}(x)$, as a polynomial in x.

[3 marks]

c) You are required to sketch the graph of the polynomial function

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

(i) What is the degree of f ?
(ii) Find the zeros of f and their multiplicities.
At each zero, determine whether the graph of f crosses or touches the x-axis.

(iii) Find the y-intercept of the graph of f .
(iv) Determine the end behavior of f .
(v) Sketch the graph of the function f . Make sure that your graph shows all intercepts and exhibits the proper end behaviour.

[5 marks]

Continued …….

QUESTION 4 [10 marks]

a) Use long division to find the quotient and the remainder when the polynomial $2x^5 - x^3 + 2$ is divided by $x^2 - 1$.

You are required to state clearly what the quotient and the remainder are.

[3 marks]

b) Given $H(x) = 3\left(\frac{1}{2}\right)^x - 2$.

(i) Find $H(-2)$.

(ii) Find the value of x such that $H(x) = -\frac{13}{8}$.

[3 marks]

c) The graph of $y = a\ln(x+b)$ passes through points $(0,0)$ and $(2,-2\ln 3)$.
Find the values of a and b.

[3 marks]

d) Solve $1 + \ln e^{x+1} = 5$.

[1 mark]

Continued …….

QUESTION 5 [10 marks]

a) Find the equation of circle that has the points (-1, 6) and (3, -4) as the endpoints of its diameter. [2.5 marks]

b) Find an equation of the line that passes through the point (4, -3) and is perpendicular to the line $2x - 3y + 5 = 0$. Write the equation in slope-intercept form. [2.5 marks]

c) Consider the graph of the quadratic function $f(x) = (x-2)^2 - 1$, which is a parabola.

(i) Determine the coordinates of its vertex.

(ii) Determine also its x-intercepts and its y-intercept.

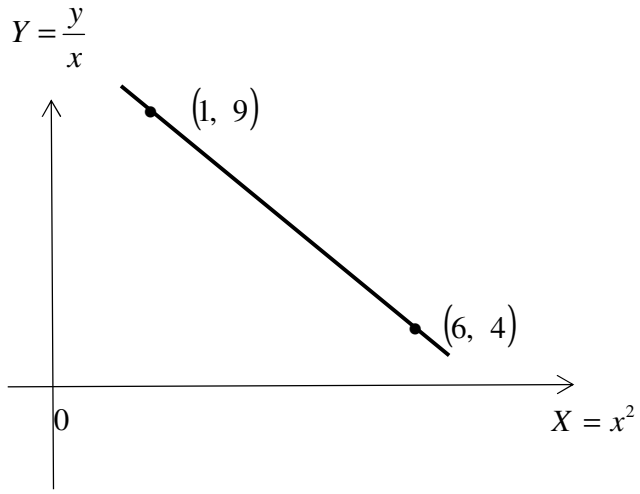
(iii) Hence sketch the graph.

[3 marks]

d) Two variables x and y are related by an equation $y = ax^3 + bx$ where a and b are constants.

The figure below shows a straight line graph by plotting $Y = \frac{y}{x}$ against $X = x^2$.

Points $(1, 9)$ and $(6, 4)$ lie on the line.



Find the values of a and b.

[2 marks]

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