MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/2016

PMT0101 – MATHEMATICS I

(All sections/ Groups)

08 MARCH 2016
(2.30 p.m. – 4.30 p.m.)
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 5 pages with **FIVE** questions.

2. Attempt **ALL** five 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. All necessary working steps **MUST** be shown.

4. **No calculators are allowed**.

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You are required to write proper steps.

Question 1 [10 marks]

a) Simplify the expression and write your final expression as a fraction with no negative exponents.

$$\left(5x^2y^{-\frac{3}{2}}z^{\frac{1}{4}}\right)\left(4x^4y^{\frac{1}{2}}z^{\frac{3}{4}}\right)$$ (2 marks)

b) Rationalize the denominator for $\dfrac{1-3\sqrt{2}}{3\sqrt{2}+2}$ and simplify. (2 marks)

c) Simplify the following expression.
Leave your answer in the form $k\sqrt{5}$ where k is a negative constant.

$$\sqrt{80}-10\sqrt{20}+4\sqrt{5}$$ (2 marks)

d) Simplify the following expression to a single fraction:

$$\frac{1}{2\sqrt{7}-3}-\frac{1}{2\sqrt{7}+3}$$ (2 marks)

e) Given $z=3(7+7i)+(5+6i)i$.

i) Express z in the form $a+bi$ where a and b are real numbers and i is an imaginary unit.

ii) Hence, find the conjugate of z. (2 marks)

Continued …

Question 2 [10 marks]

a) Solve the equation $x^2 - 4x + 8 = 0$ by using quadratic formula.
Leave your answer in the form $a + bi$ if necessary.

[Hint: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$] (2 marks)

b) Solve the inequality $(2x + 1)(x + 2)(x - 3) \geq 0$.
Show clearly your Sign Diagram and leave your answer in interval notation.

(3 marks)

c) Solve the equation $|3x - 15| > 3$. Leave your answer in interval notation.

(2 marks)

d) Solve $\sqrt{x+1} = 3 - \sqrt{x}$. Remember to check your answer.

(3 marks)

Continued …

Question 3 [10 marks]

a) Given $h(x) = 2x + 3$ and $g(x) = \frac{1}{x-1}$.

i) Find the domains of h and g. Leave your answers in interval notation.

ii) Find $(g \circ h)(x)$.
Hence, find the **domain** of $g \circ h$. Leave your answer in interval notation.

iii) Find $h^{-1}(x)$.

(4 marks)

b) Given a polynomial function $P(x) = x^3 - 19x + 30$.

i) By remainder theorem, show that $(x-2)$ is a factor of $P(x)$.

ii) Use **long division** to find the quotient when $P(x)$ is divided by $(x-2)$.

iii) Factorize $P(x)$ completely.

iv) Hence, solve $P(x) = 0$.

(6 marks)

Continued …

Question 4 [10 marks]

a) Given a polynomial function $f(x)=2(x+4)^2(x+1)^2(x-4)$.

i) What is the **degree** of f ?

ii) Determine **the zeros** of f **and their multiplicities**.
Also, determine whether the graph of f crosses or touches the x-axis at each zero.

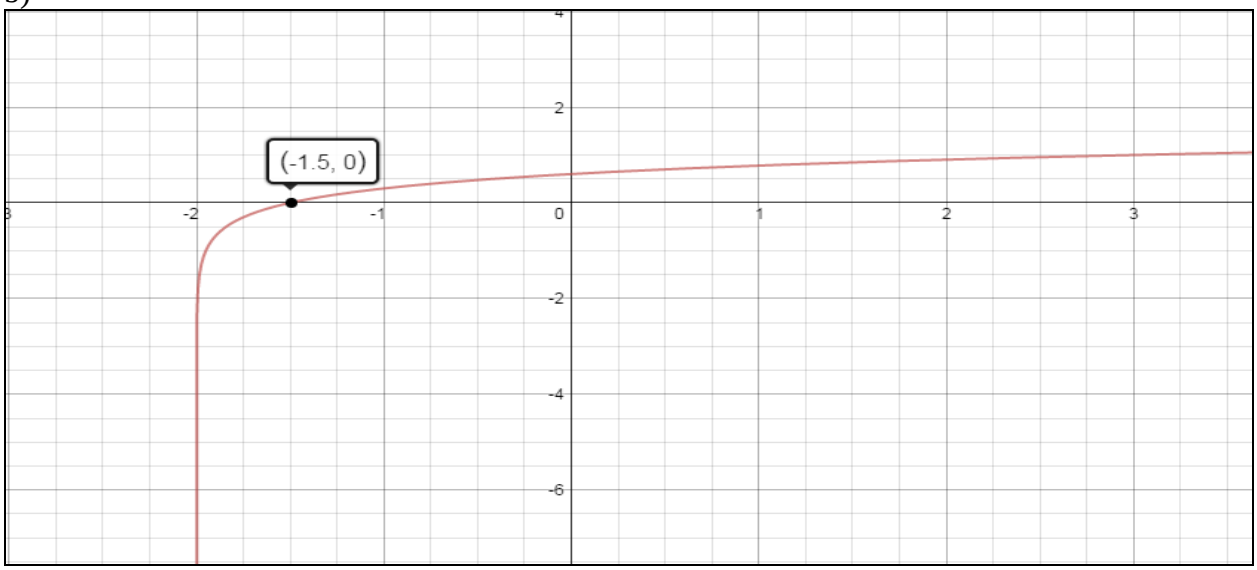
iii) Determine its y-intercept.

iv) Determine the end behavior of f.

v) Sketch the graph of the polynomial function.
Make sure your graph shows all intercepts and exhibits the proper end behaviour.

(5 marks)

b)



The figure above shows the graph of function $f(x)=\log_{10}(kx+4)$.
The graph passes through point $(-1.5,\ 0)$.

i) Find the value of k.

ii) Is the function a one-to-one function?

(2 marks)

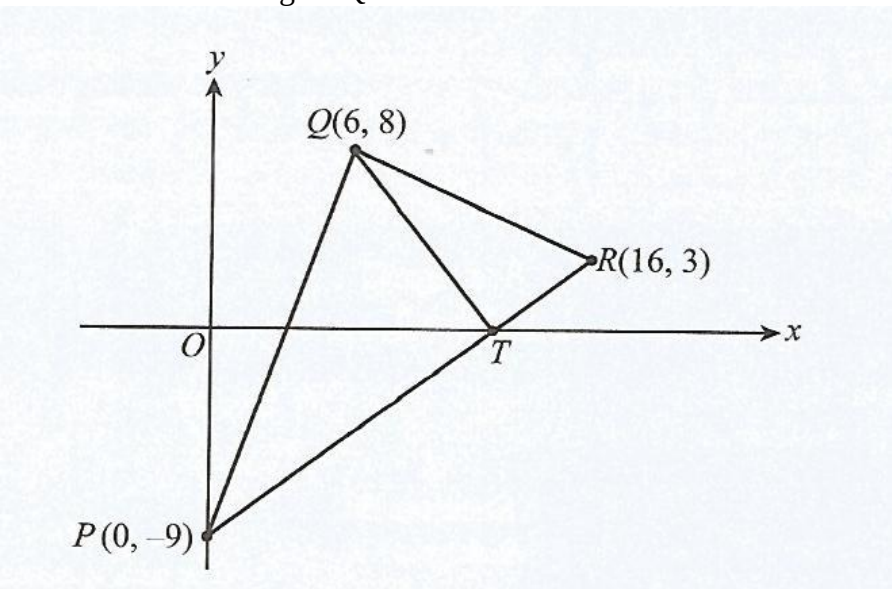
c) Solve the equation : $\log_2(x^2+2)=1+\log_2(x+5)$

(3 marks)

Continued …

Question 5 [10 marks]

Diagram below shows a triangle *PQR*.



Point *T* lies on the *x*-axis.
It is given that straight lines *PR* and *QT* are **perpendicular**.

a) i) Find the gradient of *PR* and *QT*.

ii) Find the equation of straight line *QT*.

iii) Find the coordinates of *T*.

(4 marks)

b) If the straight line *QT* is extended to a point *S* such that $\frac{QT}{TS} = \frac{2}{3}$, find the coordinate of *S*.

(3 marks)

c) Point $K(x, y)$ moves such that it has a distance of 3 units from point *Q*. Find the equation of the locus of *K*.

(3 marks)

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