MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

PMT0101 – MATHEMATICS I

(Foundation in Information Technology)

11 OCTOBER 2017
9:00 a.m. – 11:00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 6 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. **Show all relevant steps** to obtain maximum marks.

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 positive exponents.

$$\frac{\left(16x^2y^{-\frac{1}{3}}\right)^{\frac{3}{4}}}{\left(xy^{\frac{3}{2}}\right)^{\frac{1}{2}}}$$

(2 marks)

b) Rationalize the denominator for $\frac{1+\sqrt{5}}{\sqrt{5}-1}$ and simplify. (2 marks)

c) Simplify the following expression and give your final expression as a single term.

$$5x\sqrt{\frac{3y^2}{2}}-3y\sqrt{\frac{27x^2}{2}}+2\sqrt{\frac{3x^2y^2}{2}} \quad , \quad x\geq 0, \quad y\geq 0$$

(2 marks)

d) Factorize the following polynomial completely.

$$3\left(x^2+10x+25\right)-\left(4x+20\right)$$

(2 marks)

e) Simplify the expression below and write your final answer in standard form $a+bi$, where a and b are real numbers.

$$i^7+4i^3-2i^2+1$$

(2 marks)

Continued …

Question 2 (10 marks)

a) Find the values of *k* such that the quadratic equation $kx^2 + x + 4 = 0$ has no real solution.

(2 marks)

b) Solve the equation: $x^4 = 4x^2$.

(2 marks)

c) Solve the equation: $\frac{3}{4}|x+1| = 9.$ (1.5 marks)

d) i) Find the domain of the expression $\frac{(x-2)(x+1)}{x+3}$.

Write your domain in interval notation.

ii) Solve the inequality $\frac{(x-2)(x+1)}{x+3} \leq 0.$

Show clearly your Sign Diagram and give your final answer in interval notation.

iii) Hence, find the domain of $h(x) = \sqrt{\frac{(x-2)(x+1)}{x+3}}$.

Give your final answer in interval notation.

(4.5 marks)

Continued …

Question 3 (10 marks)

a) Given $f(x)=\sqrt{x}$ and $g(x)=3x-5$, find

i) the domains of f and g.
Write your answer in interval notation.

ii) $(f\circ g)(x)$ and the domain of $(f\circ g)$.

iii) $g^{-1}(x)$.

(3.5 marks)

b) Given a piecewise-defined function :

$$f(x)=\begin{cases} 3x & if \quad -2<x\le 1 \\ x+1 & if \quad x>1 \end{cases}$$

i) Find the domain of *f*. Write your answer in interval notation.

ii) Find $f(5)$ and $f(0)$.

(1.5 marks)

c) Given the polynomial function $f(x)=-(x-4)(x+3)^2(x-1)^3$.

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)

Continued …

Question 4 (10 marks)

a) Use the Factor Theorem to determine whether $(x+3)$ is a factor of $f(x)=2x^3-x^2+2x-3.$

(1.5 marks)

b) Given $\log_a 3 = m$ and $\log_a 2 = n$, express $\log_a 12$ in terms of m and n.

(1.5 marks)

c) The graph of $g(x)=3\log_2(x-1)$ passes through point $(k,\ 9)$.

i) Determine the value of *k*.

ii) Find the *x*-intercept of the graph.

(3 marks)

d) Solve the following equations:

i) $5^{2x+3}=\dfrac{1}{125}$

ii) $7^{x+3}=e^x$
Leave your final answer in terms of natural logarithms.

(4 marks)

Continued…

Question 5 (10 marks)

a) The equations of two lines are $3x + ky + 2 = 0$ and $4x + y - 1 = 0$.
Find the value of *k* if the lines are

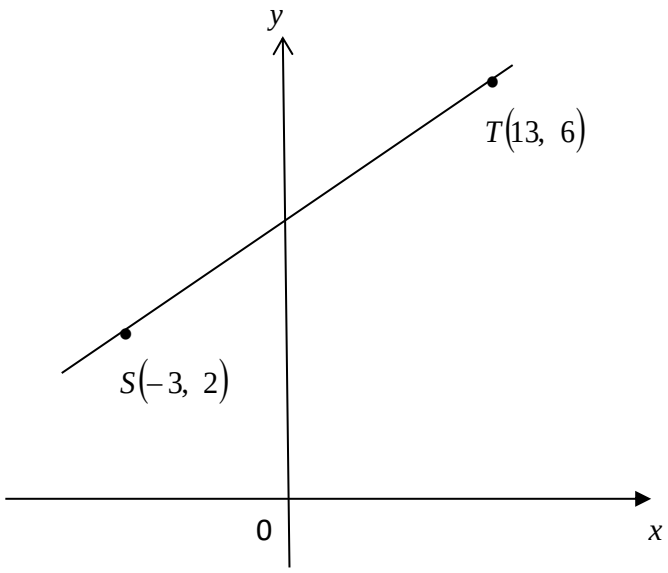
i) parallel

ii) perpendicular (2 marks)

b) By completing the square method, transform the equation of a circle $x^2 + y^2 + 8x - 10y + 16 = 0$ to the form $(x-h)^2 + (y-k)^2 = r^2$ where *h*, *k* and *r* are constants.

Hence, find the center and radius of the circle. (3 marks)

c) The diagram below shows part of a straight line which passes through points $S(-3,\ 2)$ and $T(13,\ 6)$.

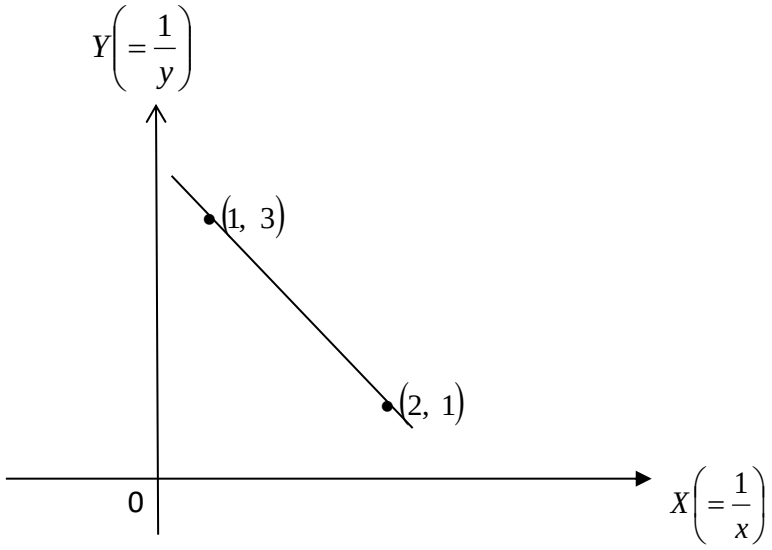


Find an equation of the locus of a moving point $P(x,\ y)$ which is always equidistant from points $S(-3,\ 2)$ and $T(13,\ 6)$.

(3 marks)

Continued…

d) The diagram below shows part of a straight line obtained by plotting $Y\left(=\frac{1}{y}\right)$ against $X\left(=\frac{1}{x}\right)$.



Express y in terms of x.

(2 marks)

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