

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2015/2016

PMT0101 – MATHEMATICS I

(Foundation in Information Technology)

15 October 2015
9:00 a.m. 11:00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 5 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.**

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You are required to write proper steps.

ANSWER ALL QUESTIONS.

QUESTION 1 [10 marks]

- (a) Simplify the expression and write your final expression as a fraction with no negative exponent.

$$\frac{3x^4y^{-3}}{(6x^3y)^2} \quad (2 \text{ marks})$$

- (b) Rationalize the denominator and simplify.

$$\frac{6}{\sqrt{7}-2} \quad (2 \text{ marks})$$

- (c) Perform the indicated operation and write the final result in the standard form $a + bi$.

$$\frac{2-i}{3-i} \quad (2 \text{ marks})$$

- (d) Factor the polynomial.

$$27x^3 + 8 \quad (2 \text{ marks})$$

- (e) Simplify the expression and give the final answer as a single fraction.

$$\frac{7}{(x-2)(x-1)} - \frac{4}{(x-2)(x+2)} \quad (2 \text{ marks})$$

Continued

QUESTION 2 [10 marks]

(a) (i) Solve the quadratic equation $2x^2 + 5x - 7 = 0$.

(ii) Solve the inequality $(2x + 7)(x - 1) > 0$.

Give your final answer in interval notation.

(iii) Find the domain of the function $f(x) = \sqrt{\frac{1}{(2x + 7)(x - 1)}}$.

Give your final answer in interval notation.

(5 marks)

(b) Solve the equation $|8x + 1| = 8$.

(2 marks)

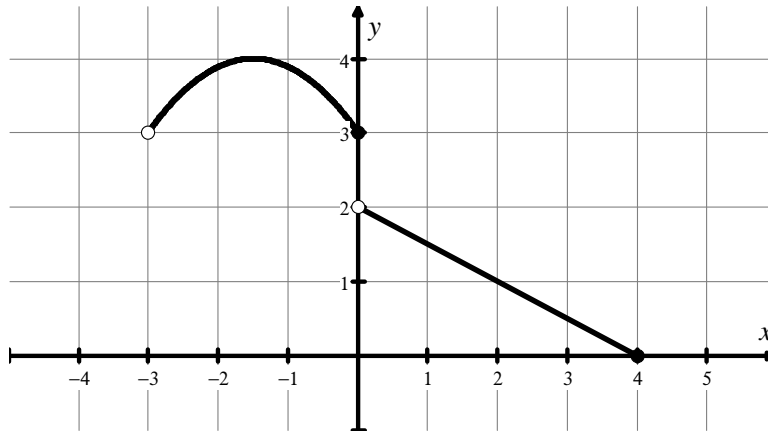
(c) Solve the equation $x = \sqrt{3x + 4}$. Remember to check your answers.

(3 marks)

Continued

QUESTION 3 [10 marks]

- (a) The figure shows the graph of a function.
(The axes are marked off in one-unit intervals.)



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

(2 marks)

- (b) Given the functions $f(x) = \sqrt{x+2}$ and $g(x) = \frac{1}{x+3}$, find

- (i) $(f \circ g)(1)$, giving your final answer in the form $\frac{m}{n}$ where m and n are integers.
 (ii) $f^{-1}(x)$, as a polynomial in x .

(3 marks)

- (c) Consider the polynomial function $f(x) = -\frac{1}{2}(x-1)^2(x-3)^2(x+1)$.

- (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 f .
 (iv) Determine the end behavior of f .
 (v) Sketch the graph of the function f . Show all its intercepts and its end behavior.

(5 marks)

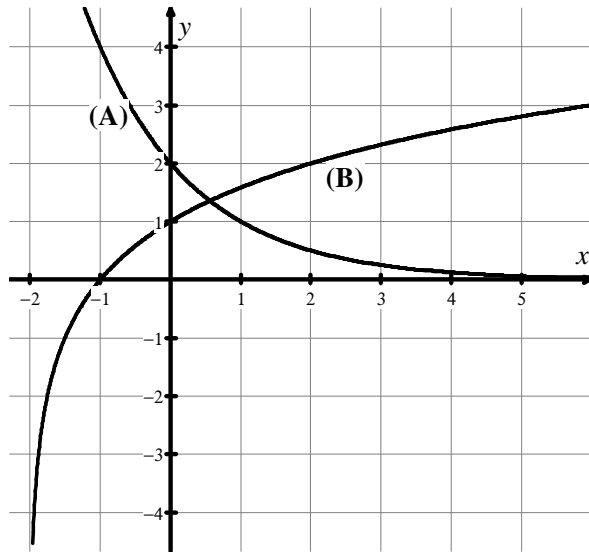
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QUESTION 4 [10 marks]

- (a) Solve the inequality $-7 \leq 3 - 2x < 11$, giving your final answer in interval notation.
(2 marks)

- (b) The figure below shows the graphs of two functions selected from the list:

$$f(x) = 2^{-x+1}, \quad g(x) = \log_2(x-1), \quad h(x) = \log_2(x+2), \quad p(x) = 2^{x+1}$$



- (i) Write down the function whose graph is labelled (A).
- (ii) Write down the function whose graph is labelled (B).
(2 marks)
- (c) (i) Write $f(x) = x^2 + 4x + 1$ in the standard form $(x - h)^2 + k$ where h and k are some constants.
- (ii) Determine the vertex and the y -intercept of the graph of $f(x) = x^2 + 4x + 1$.
- (iii) Sketch the graph of $y = x^2$ and the graph of $f(x) = x^2 + 4x + 1$ on the same axes.
Indicate clearly the vertex and y -intercept of the second graph.
(3 marks)
- (d) Use long division to find the quotient and the remainder when the polynomial $3x^3 + x^2 + 10x + 1$ is divided by $x^2 + 6$.
You are required to state clearly what the quotient and the remainder are.
(3 marks)

Continued

QUESTION 5 [10 marks]

- (a) Rewrite the sum $\sum_{k=2}^5 (3k-1)$ without the sigma notation and then evaluate the sum.

(2 marks)

- (b) Determine the common difference of the arithmetic sequence 10, 6, 2, -2, ...

Then find the sum of the first 30 terms of the sequence.

(2 marks)

- (c) Is the infinite geometric series

$$\frac{1}{2} - \frac{1}{3} + \frac{2}{9} - \frac{4}{27} + \dots \quad \text{convergent?}$$

Give reason for your answer.

If the series is convergent, find its sum.

(3 marks)

- (d) Find the slope of the straight line l_1 with equation $3x + 2y + 1 = 0$.

Then use it to obtain an equation for the line l_2 which passes through the point $(-1, 2)$ and is parallel to the line l_1 .

Finally present the equation in the general form $Ax + By + C = 0$.

(3 marks)

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