

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

PMT0101 – MATHEMATICS I

(All sections / Groups)

26 MAY 2017
3:00 p.m. – 5:00 p.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.**

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QUESTION 1 [10 marks]

- (a) Simplify the expression and write your final expression as a fraction with no negative exponents. Assume all variables have nonzero values.

$$\left(\frac{-2xy^{-2}}{y^3}\right)^2 \cdot \left(\frac{x^{-4}}{4y^2}\right) \quad [2 \text{ marks}]$$

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

- (c) Simplify the following expression and write your final expression as a single term. Assume all variables have positive values.

$$-3y\sqrt{\frac{4x^2}{3}} + 2\sqrt{3x^2y^2} \quad [2 \text{ marks}]$$

- (d) Factor the polynomial completely.

$$5xy^2 - 7xy - 6x \quad [2 \text{ marks}]$$

- (e) Express $\frac{3+2i}{2-3i}$ in the form $a+bi$, where a and b are real numbers. [2 marks]

Continued

QUESTION 2 [10 marks]

- (a) Factor $x^3 - x^2 - 4x + 4$ completely.

Then use your result to solve the following equation.

$$x^3 - x^2 - 4x + 4 = 0 \quad [2.5 \text{ marks}]$$

- (b) Solve the equation $x - 4 = \sqrt{3x - 8}$. Remember to check your answers.

[3 marks]

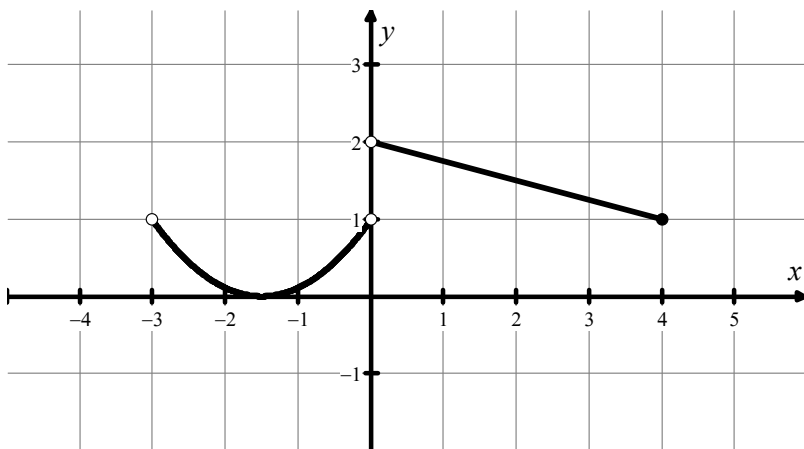
- (c) Solve $1 \leq \frac{2x-1}{-3} \leq 5$. Give your final answer in interval notation. [2 marks]

- (d) Solve the equation $|4x - 3| = 13$ [2.5 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 $f(x) = \sqrt{3+x}$ and $g(x) = \frac{6}{4x+1}$, find

- (i) $(f \circ g)(6)$, 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) Given a polynomial function $f(x) = 2x^3(x-4)^2(x+1)$.

- (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 the graph of f .
 (iv) Determine the end behavior of f .
 (v) Sketch the graph of the function f .

Make sure 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 $3x^3 - 2x^2 + 10x - 7$ is divided by $x^2 + 3$.
You are required to state clearly what the quotient and the remainder are. [3 marks]

- (b) Solve the equation $8^{3x-1} = 4^{2x+3}$. [2 marks]

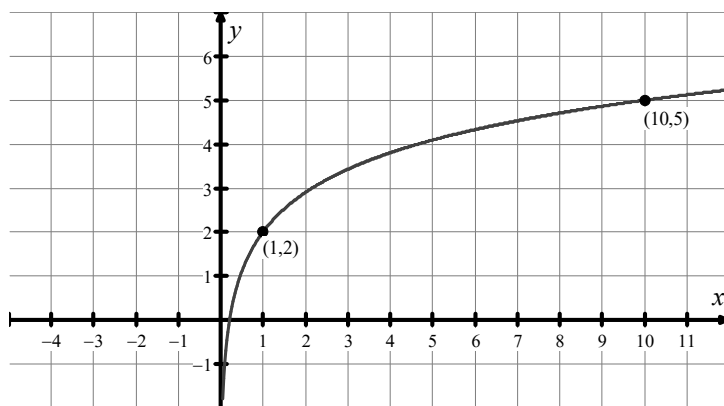
- (c) Given $h(x) = -2\left(\frac{1}{3}\right)^x + 1$.
Find the value of m such that $h(m) = 53$. [1 mark]

- (d) Express the following expression as a single natural number. Show proper steps.

$$2\log_{10} 5 + \log_{10} 12 - \log_{10} 3$$

[2 marks]

- (e) The graph of $y = a + k \log_{10} x$ passes through points (1, 2) and (10, 5).



Find the values of a and k .

[2 marks]

Continued

QUESTION 5 [10 marks]

(a) Given an equation of a circle $x^2 - 4x + y^2 + 8y - 5 = 0$.

(i) Express the equation in the form $(x - h)^2 + (y - k)^2 = r^2$ where h , k and r are constants.

(ii) Find the centre and radius of the circle. [2.5 marks]

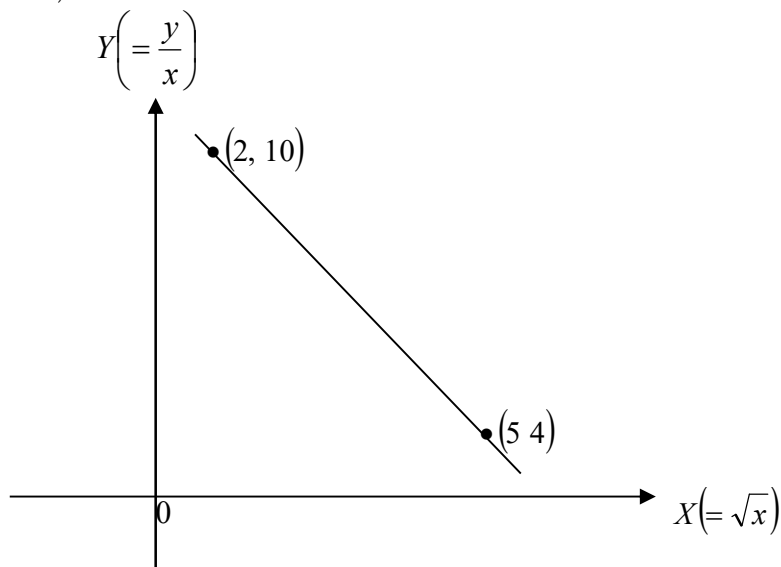
(b) Find an equation of a line that contains the point $(-1, 2)$ and is perpendicular to the line $x + 3y = 6$.

Write your final answer in the form $y = mx + b$. [2.5 marks]

(c) Find an equation of the locus of a moving point $P(x, y)$ which is always equidistant from points $A(-2, 3)$ and $B(4, -1)$. [2 marks]

(d) Two variables x and y are related by an equation $y = px + qx^{\frac{3}{2}}$, where p and q are constants.

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



(i) Rewrite the given equation to express $\frac{y}{x}$ in terms of \sqrt{x} .

(ii) Find the values of p and q .

[3 marks]

End of Page