



FINAL EXAMINATION
MARCH 2024

COURSE TITLE	BASIC MATHEMATICS
COURSE CODE	FMAT0114
DATE/DAY	11 JUNE 2024 / TUESDAY
TIME/DURATION	09:00 AM - 12:00 PM / 03 Hour(s) 00 Minute(s)

INSTRUCTIONS TO CANDIDATES :

1. Please read the instruction under each section carefully.
2. Candidates are reminded not to bring into examination hall/room any form of written materials or electronic gadget except for stationery that is permitted by the Invigilator.
3. Students who are caught breaching the Examination Rules and Regulation will be charged with an academic dishonesty and if found guilty of the offence, the maximum penalty is expulsion from the University.

(This Question Paper consists of 5 Printed Pages including front page)

*****DO NOT OPEN THE QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO*****

This paper consists of NINE (9) questions. Answer ALL questions in the answer booklet provided. [100 MARKS]

1. Solve the following to find x or the range of x .
 - a) $|5 - 2x| = |x + 4|$ (4 marks)
 - b) $(5^x)^2 + 6 = 7(5^x)$ (6 marks)
 - c) $x - \frac{4}{x} \leq \frac{5}{3}$ (5 marks)

2. A group of 112 students attend an orientation program in a university. They are divided into groups to participate in an activity. The first group consists of 4 students, the second group consists of 8 students, the third group consists of 12 students and so on. Suppose that the formation of the group follows the system above, by using methods in sequence and series, calculate
 - a) the number of groups that will be formed. (5 marks)
 - b) the number of students in the last group. (3 marks)

3. Amelia purchased a new home entertainment system that costs her RM 12000. She makes her payment through a monthly instalment system where she puts in RM 200 in the first month, RM 300 in the second month and RM 450 in the third month and so on. Given the system, by using methods in sequence and series, calculate
 - a) how many months will she take to pay the total amount. (5 marks)
 - b) the payment made on the sixth month. (2 marks)

4. Given the following equations, sketch the graph of
 - a) $4y = 8x + 4$ (6 marks)
 - b) $2x^2 + 6x + 5 = 0$ (8 marks)

5. Given the following functions, find

$$f(x) = x + 2 \quad \text{and} \quad f[g(x)] = 4x^2 + 9$$

- a) $f^{-1}(x)$ (2 marks)
- b) $g(x)$ given $f[g(x)] = 4x^2 + 9$ (4 marks)
- c) $g \circ f(x)$ based on the answer in (b). (4 marks)
6. Qaleesya is a home baker and currently selling dessert combos for Mothers' Day. Combo A consists of a box of cream puffs, a box of mini brownies and 2 boxes of cinnamon rolls and is priced at RM 196. Combo B consists of one box of cream puffs, one box of brownies and one box of cinnamon rolls and is priced at RM 158. Combo C consists of 2 boxes of cream puffs and 1 box of cinnamon rolls and is priced at RM 138.

Assume that the price of the desserts are indicated follows:

x = price of one box of cream puff
 y = price of one box of brownies
 z = price of one box of cinnamon rolls

Based on the information above, solve for x , y and z using matrices operation. (15 marks)

7. Given a polynomial of $P(x) = 3x^3 - 10x^2 - 27x + 10$,
- a) by using factor theorem, show that $(x + 2)$ is a factor of $P(x)$ (4 marks)
- b) by using long division, find the quotient when $P(x)$ is divided with $(x + 5)$. (7 marks)
8. Decompose the fraction below into its partial fraction.

$$\frac{5x-13}{(x-1)(x-3)}$$

(10 marks)

9. Determine the continuity of $f(x)$ for each of the following.

a) $f(x) = \frac{x^2-36}{x^2-x-2}$ at $x = 2$ (5 marks)

b) $f(x) = \frac{x-3}{x-9}$ at $x = 4$ (5 marks)

*** END OF QUESTION PAPER ***


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Formula

$$x^a \times x^b = x^{a+b}$$

$$\frac{x^a}{x^b} = x^{a-b}$$

$$(x^a)^b = x^{ab}$$

$$(xy)^a = x^a y^a$$

$$\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}$$

$$\frac{1}{x^a} = x^{-a}$$

$$\sqrt{x} = x^{\frac{1}{2}}$$

$$\sqrt[a]{x} = x^{\frac{1}{a}}$$

Properties of logarithms

$$\log_a(xy) = \log_a x + \log_a y$$

$$\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$\log_a x^n = n \log_a x$$

$$\log_a(\sqrt[n]{x}) = \frac{1}{n} (\log_a x)$$

$$\log_b a = \frac{\log_c a}{\log_c b}$$

Quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Arithmetic progression

$$T_n = a + (n - 1)d$$

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

Geometric progression

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(1 - r^n)}{1 - r}, r < 1$$

$$S_n = \frac{a(r^n - 1)}{r - 1}, r > 1$$

Vertex: $h = -b/2a$

Matrices

$$AX = B$$

$$A^{-1} = \frac{1}{|A|} \text{Adj}(A)$$

$$\text{Adj}(A) = [C_{ij}]^T$$

$$C_{ij} = (-1)^{i+j} M_{ij}$$

$$X = A^{-1}B$$

Partial fraction

If $Q(x)$ has a form of $(ax + b)$, then

$$\frac{P(x)}{Q(x)} = \frac{P(x)}{(x + a)(x + b)} = \frac{A}{(x + a)} + \frac{B}{(x + b)}$$

If $Q(x)$ has a form of $(ax + b)^k$ then

$$\frac{P(x)}{Q(x)} = \frac{P(x)}{(ax + b)^2} = \frac{A}{(ax + b)} + \frac{B}{(ax + b)^2}$$

If $Q(x)$ has a form of $(ax^2 + bx + c)$ then

$$\begin{aligned} \frac{P(x)}{Q(x)} &= \frac{P(x)}{(x - d)(ax^2 + bx + c)} \\ &= \frac{C}{(x - d)} + \frac{Ax + B}{(ax^2 + bx + c)} \end{aligned}$$

If $Q(x)$ has a form of $(ax^2 + bx + c)^k$ then

$$\begin{aligned} \frac{P(x)}{Q(x)} &= \frac{P(x)}{(ax^2 + bx + c)^2} \\ &= \frac{Ax + B}{(ax^2 + bx + c)} + \frac{Cx + D}{(ax^2 + bx + c)^2} \end{aligned}$$