



FINAL
Examination Paper

(COVER PAGE)

Session : January / February 2016

Programme : Diploma In Business (DIB)

Course : MAT1106: Business Mathematics

Date of Examination : March 18, 2016 (Friday)

Time : 8.00am – 10.00am Reading Time : Nil

Duration : 2 Hours

Special Instructions :

Answer any FIVE (5) structured-type questions.

Materials permitted : Non-Programmable Calculator

Materials provided : Formula sheet, Graph paper

Examiner(s) : Mr. Dinesh Kumar, Ms. Hatin Fatihah Hassan,
Mr. Josh Si Chong En, Mr. Billy Siew Woo Bing

Moderator : Dr. Ch'ng Pei Eng

This paper consists of 5 printed pages, including the cover page

DIPLOMA IN BUSINESS (DIB)
MAT1106: BUSINESS MATHEMATICS
FINAL EXAMINATION: JANUARY / FEBRUARY 2016 SESSION

Instructions: This paper consists of **SIX (6)** structured-type questions. Answer **FIVE (5)** out of SIX structured-type the questions in the answer booklet provided. All questions carry equal marks of 20 marks.

Question 1

(a) Factorize the expression completely: $48x^4z^3 - 3y^4z^3$. (4 marks)

(b) Simplify the following without leaving negative exponents.

$$\left(\frac{9x^5y^{-2}}{3x^4y^2}\right)^{-2} \quad (4 \text{ marks})$$

(c) Solve the quadratic equation by using *formula*: $4x^2 = 2x + 9$ (4 marks)

(d) Simplify the following:

(i) $4\sqrt{15}(\sqrt{6} + \sqrt{24})$ (4 marks)

(ii) $\frac{2\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$ (4 marks)

Question 2

(a) Write an equation of a line which is *parallel* to the line $4y + 2x + 8 = 0$ and passing through the point $(\frac{1}{2}, 3)$. (4 marks)

(b) Given $f(x) = -x^2 - 2x + 3$, sketch the graph of $f(x)$ by indicating the *vertex point*, *y - intercept* and *x - intercept* clearly. (7 marks)

(c) Given that $f(x) = \frac{2x}{x+2}$ and $g(x) = 3x - 1$, find

(i) $g \circ f(-3)$. (2 marks)

(ii) the value of x if: $f(3) = g(x)$ (4 marks)

(d) Differentiate with respect to x :

$$y = (3x^2 + 2x)^{-2} \quad (3 \text{ marks})$$

Question 3

- (a) A company manufactures and sells x videophones per week. The weekly price demand and cost equations are respectively,

$$p = 500 - 0.5x$$

$$C(x) = 20,000 + 135x$$

- (i) Find the revenue function. (1 mark)
- (ii) Find the profit function. (2 marks)
- (iii) What is the maximum weekly profit and how many videophones should be produced to realize the maximum weekly profit? (3 marks)
- (b) Suppose that the cost of a house in RM 210,000 today, how much will it cost in 10 years' time if the inflation rate over that period averages:
- (i) 3% compounded monthly? (3 marks)
- (ii) 3% compounded continuously? (3 marks)
- (c) A couple bought a home and the home was financed for RM 504,000 by signing a 35 year mortgage at 4.5% per annum compounded monthly.
- (i) Calculate the monthly installment. (3 marks)
- (ii) Find the total interest charged? (2 marks)
- (iii) If the couple has paid for the first 25 years and they want to settle the remaining balance. How much should the couple pay to the financier? (3 marks)

Question 4

- (a) Given matrix $A = \begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}$ $B = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & -1 & 2 \\ -1 & 3 & 4 \end{bmatrix}$

- (i) Find $[AB]^T$ (3 marks)
- (ii) Find $[B - A]C$ (4 marks)
- (iii) Find the inverse of *matrix A* (3 marks)
- (b) Solve the system of equations by using *any matrices method*:

$$-8x - 10y = 24$$

$$6x + 5y = 2$$

(6 marks)

- (c) Evaluate the following integral: $\int_0^3 (2x + 4)^2 dx$ (4 marks)

Question 5

- (a) If $P = 2x + y$, find the *maximum* value of P subject to the given constraints:

$$\begin{cases} 5x + y \geq 20 \\ x + y \leq 12 \\ x + 3y \geq 18 \end{cases}$$

(7 marks)

- (b) Find the relative maximum and relative minimum of the function $f(x) = x^3 - 6x^2 + 9x + 1$.
(6 marks)

- (c) The table below shows the sales of a tile over the last 11 months.

Month	1	2	3	4	5	6	7	8	9	10	11
No. of sales	3650	4010	3870	3500	3300	3100	2980	3100	3200	3450	3500

- (i) Use a three-month moving average for the sales of the tile to forecast for the month 9.
Hence, find the forecast error for the month of 9 (3 marks)
- (ii) Use a five-month moving average for the sales of the tile to forecast for the month 9.
Hence, find the forecast error for the month of 9 (4 marks)

Question 6

- (a) Given the first four terms of a geometric progression are: 1, -5, 25, -125, ...

- (i) Find the 10th term. (2 marks)
- (ii) Calculate the sum of the first 9 terms of the GP. (3 marks)

- (b) Given the first four terms of an arithmetic progression are: -7, -9, -11, -13, ...

- (i) Find the 40th term. (2 marks)
- (ii) Calculate the sum of the first 41 terms. (4 marks)

(c) Simplify the following expression. $\frac{x^4-16}{x+2}$ (4 marks)

(d) Solve for y .

$$\frac{6}{y-6} - \frac{y}{y-6} = -2$$

(5 marks)

~THE END~

MAT1106(F) January/February 2016

Formulas: MAT1106 (BUSINESS MATHEMATICS)

1) *Quadratic Formula*: $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2) *Vertex of a parabola*: $f(x) = ax^2 + bx + c: \left[-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right]$

3) *Differentiation properties*:

$$\frac{d}{dx} x^n = nx^{n-1}$$

$$\frac{d}{dx} [f(x)g(x)] = f(x)g'(x) + f'(x)g(x),$$

$$\frac{d}{dx} \left[\frac{f(x)}{g(x)} \right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$$

4) *Integration properties*:

$$\int z^r dz = \frac{z^{r+1}}{r+1} + C$$

$$\int_a^b f(x) dx = F(b) - F(a).$$

5) *Compound interest*: $A = p\left(1 + \frac{r}{k}\right)^{kt}$

6) *Continuous compound interest*: $A = Pe^{rt}$

7) *Arithmetic sequences*:

i. $a_n = a_1 + (n - 1)d$

ii. $S_n = \frac{n(a_1 + a_n)}{2}$

8) *Geometric sequences:*

i. $a_n = a_1 r^{n-1}$

ii. $S_n = \frac{a_1 - a_1 r^n}{1-r} \quad r < 1$

9) *Simple interest* : $I = Prt$

10) *Future value* : $FV = PMT \frac{(1+i)^n - 1}{i}$

11) *Sinking fund* : $PMT = FV \frac{i}{(1+i)^n - 1}$

12) *Present value* : $PV = PMT \frac{1 - (1+i)^{-n}}{i}$

13) *Amortization* : $PMT = PV \frac{i}{1 - (1+i)^{-n}}$

14) *Inverse matrix* : $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \text{ ---- } A^{-1} = \frac{1}{ad-bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

