

FINAL
Examination Paper

(COVER PAGE)

Session : APRIL 2017

Programme : Diploma in Business (DIB)

Course : **MAT1106: Business Mathematics**

Date of Examination : 05 August, 2017 (Saturday)

Time : 8:00am – 10:00am Reading Time : Nil

Duration : 2 Hours

Special Instructions :

This paper consists of **SIX (6)** questions.

Answer any **FIVE (5)** questions in the answer booklet provided.

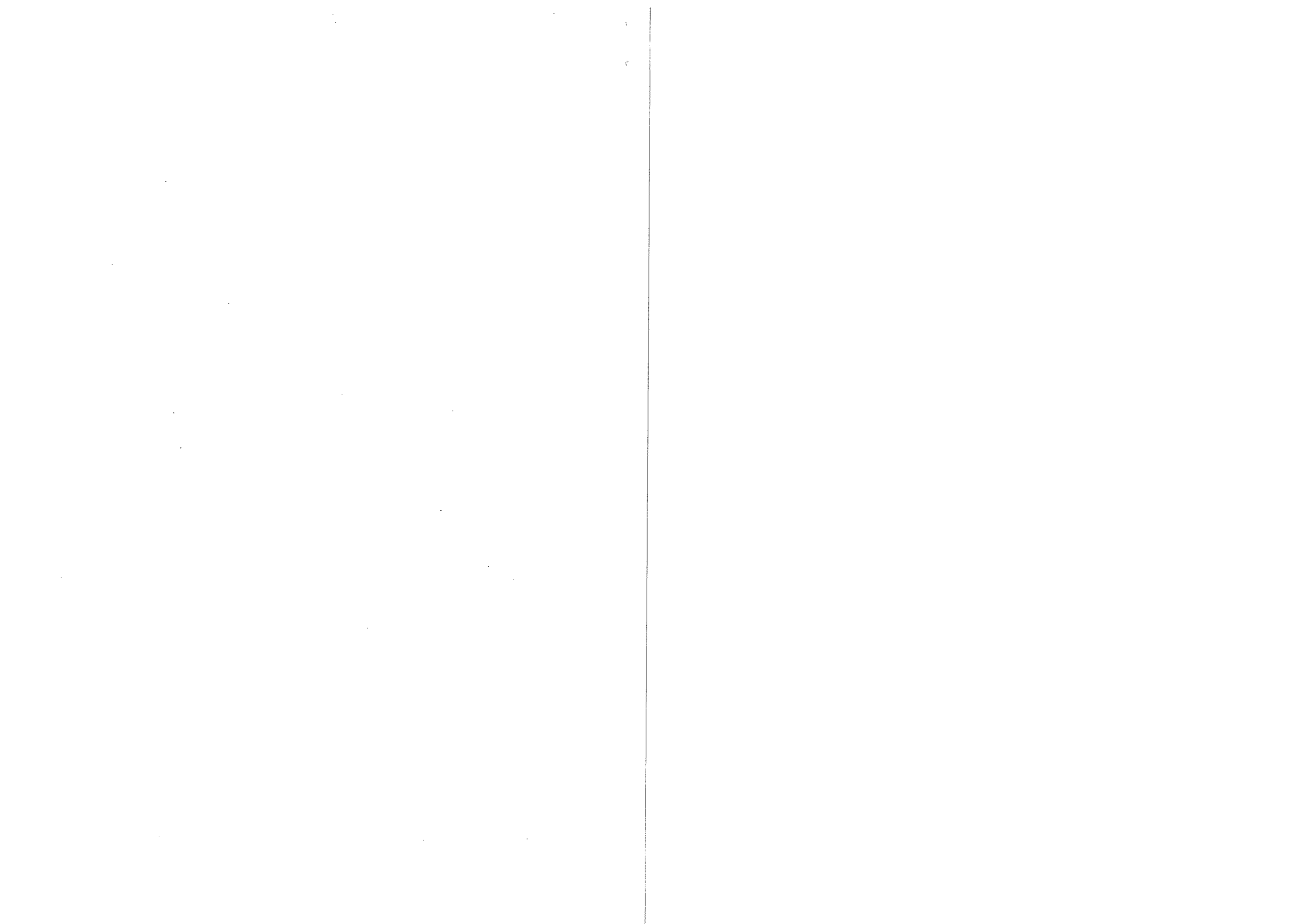
Materials permitted : Non-Programmable Calculator

Materials provided : Formula sheet, Graph paper

Examiner(s) : **Dinesh Kumar Govindasamy, Billy Siew, Fang Yen Yen**
And Maslan

Moderator : Dr Ch'ng Pei Eng

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



DIPLOMA IN BUSINESS PROGRAMME (DIB)
 MAT1106: BUSINESS MATHEMATICS
 FINAL EXAMINATION: APRIL 2017 SESSION

Instruction: This paper consists of **SIX (6)** structured-type questions. Answer **FIVE (5)** out of SIX structured-type the questions in the answer booklet provided.

Question 1

(a) Simplify the following:

(i) $2(\sqrt{50} + \sqrt{72})$ (3 marks)

(ii) $\left(\frac{x^2y^3}{2x^4y^2}\right)^2$ (3 marks)

(b) Expand $(x + 2)^2 + x^2 + 3$ (2 marks)(c) Factorize the expression completely $4x^2 - 16$ (2 marks)

(d) Simplify:

$$\frac{x^2}{x+2} - \frac{4}{x+2}$$
 (3 marks)

(e) Use the quadratic formula to solve $x^2 - 3x - 4 = 0$. (4 marks)(f) Solve for x : $-2x + 2(3x - 6) = -3x + 9$. (3 marks)**Question 2**(a) Given that $f(x) = 2x - 3$ and $g(x) = x^2$, find

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

(ii) the value(s) of x if $f(x) + g(x) = 11$. (3 marks)(b) Write the equation of a line that passes through the point $(-1,3)$ and $(4,2)$. (5 marks)(c) Given $f(x) = x^2 - 4x - 12$, sketch the graph of $f(x)$ by indicating the vertex point, y - intercept and x - intercept clearly. (6 marks)(d) Solve for x $3 - 2x \leq 9$. (3 marks)

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Question 3

(a) Differentiate the following with respect to x :

(i) $y = 2x^3 + x^2 - 3x$ (2 marks)

(ii) $y = (x^2 + 3x)^{-1}$ (3 marks)

(b) The price demand function of a product is given by, $p = 600 - x$. Where p is the price (in RM) per unit and x is quantity demanded.

(i) Write the revenue function as a function of x and determine the production level that will maximize the total revenue. (6 marks)

(ii) What is the price charged per unit at the maximum revenue point? (2 marks)

(c) Evaluate the integral

$$\int_0^2 (4x^3 + 3x^2 - 2) dx.$$

(4 marks)

(d) Solve for x : $\sqrt{x-2} + 4 = 10$. (3 marks)

Question 4

(a) RM 18,000 is invested for five years in a bank, earning a simple interest rate of 4.5% per annum. Find the simple amount at the end of the investment period. (2 marks)

(b) Kevin deposited RM 55,000 in a saving account that earned interest at 4.2% compounded monthly for 5 years. Find the interest earned by Kevin. (4 marks)

(c) Find the future value of annuities of RM 600, invested every month for 10 years at 8% compounded monthly. Find the interest earned. (4 marks)

(d) Find the present value of an annuity of RM 5,000 yearly for 6 years at 4.7% compounded annually. How much interest was earned? (4 marks)

(e) Find the amount that must be deposited monthly at 5.5% compounded monthly for three years to accumulate an amount of RM 4,000. (3 marks)

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- (f) A loan of RM 1,000 at 6% compounded monthly is to be amortized by 12 monthly payments. Calculate the monthly payments. (3 marks)

Question 5

(a) Given matrix $A = \begin{bmatrix} 1 & 0 \\ 0 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 \\ -3 & 1 \end{bmatrix}$.

(i) Find $2B + A$ (3 marks)

(ii) Find $2(BA)^T$ (4 marks)

(iii) Find B^{-1} (3 marks)

- (b) Solve the system of equations by using any matrices method:

$$\begin{aligned} 3x - 4y &= -5 \\ -10x + 4y &= 12 \end{aligned}$$

(4 marks)

- (c) The first three terms of a geometric progression given as: 50, 10, 2, ...

(i) Find the 4th term of the sequence. (3 marks)

(ii) Find the sum of the first 5 terms of the sequence. (3 marks)

Question 6

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

$$\begin{aligned} y &\leq x + 4 \\ y &\geq 2x - 8 \\ y &\leq 7 - \frac{x}{2} \\ x &\geq 0, \quad y &\geq 0 \end{aligned}$$

(7 marks)

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- (b) The table below shows the sales of product over the last 8 weeks.

Week	1	2	3	4	5	6	7	8
Sales in thousands of units	450	465	465	440	430	444	445	449

Use a five-week moving average for the department store sales to forecast for week 7 and thus find the forecast error for week 7. (4 marks)

- (c) Find the coordinates of the turning points on the curve $y = 2x^3 - 3x^2 + 5$ and determine their nature. (6 marks)
- (d) Solve for x : $\frac{3}{x} + \frac{5}{2} = 2$. (3 marks)

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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:**

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

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

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

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) $C(x) = F + v_x$

6) $R(x) = P \cdot x$

7) $P(x) = R(x) - C(x)$

8) Break Even: $R(x) = C(x)$

9) **Compound interest:** $S = P\left(1 + \frac{r}{k}\right)^{kt}$

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

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11) *Arithmetic sequences:*

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

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

12) *Geometric sequences:*

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

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

iii. $S_n = \frac{a_1 r^n - a_1}{r - 1} \quad r > 1$

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

14) *Simple Amount : $S = P(1 + rt)$*

15) *Future value : $FV = PMT \left[\frac{(1 + \frac{r}{k})^{kt} - 1}{\frac{r}{k}} \right]$*

16) *Sinking fund : $PMT = FV \left[\frac{\frac{r}{k}}{(1 + \frac{r}{k})^{kt} - 1} \right]$*

17) *Present value : $PV = PMT \left[\frac{1 - (1 + \frac{r}{k})^{-kt}}{\frac{r}{k}} \right]$*

18) *Amortization : $PMT = PV \left[\frac{\frac{r}{k}}{1 - (1 + \frac{r}{k})^{-kt}} \right]$*

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

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