



FINAL  
Examination Paper

(COVER PAGE)

Session : August 2015

Programme : Diploma In Business (DIB)

Course : MAT1106: Business Mathematics

Date of Examination : December 7, 2015

Time : 11.00am – 1.00pm 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. Saemila Devi, Mr. Josh Si Chong En,  
Mr. Foo Kai Pin, Ms. Fang Yen Yen, Mr. Billy Siew Woo Bing,  
Mr. Wong Sin Wei

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: AUGUST 2015 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) Simplify the following:

(i)  $2\sqrt{32} - \frac{\sqrt{72}}{3}$  (3 marks)

(ii)  $\left(\frac{6x^{-1}y^{-1}}{3x^{-2}y^4}\right)^2$  (4 marks)

(b) Expand:  $(x - 3)(x + 3)^2$  (3 marks)

(c) Factorize the expression completely:  $4x^3 - 32$ . (3 marks)

(d) Simplify:  $\frac{2}{x-1} - \frac{x}{x^2-1}$  (3 marks)

(e) Solve the quadratic equation by using *formula*:  $2x^2 = 4x + 1$  (4 marks)

**Question 2**

(a) Given that  $f(x) = x - 4$  and  $g(x) = x^2 - 1$ , find

(i)  $f(-1) - g(-2)$ . (3 marks)

(ii) the value(s) of  $x$  if:  $f[g(x)] = 4$  (4 marks)

(b) Write an equation of a line which is *parallel* to the line  $y = 3x + 6$  and passing through the point  $(1, -6)$ . (4 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. (5 marks)

(d) Rationalize the denominator:  $\frac{2-\sqrt{5}}{2+\sqrt{5}}$  (4 marks)

## Question 3

- (a) Differentiate the following with respect to
- $x$
- :

$$y = (-6x^2 - 1)^{\frac{1}{3}}$$

(3 marks)

- (b) A stationery supply company sells
- $x$
- whiteboard markers per year at RM
- $p$
- per marker. The demand equation for these markers is
- $p = 10 - 0.001x$
- . The total annual cost,
- $C(x)$
- in RM, of manufacturing
- $x$
- whiteboard markers for the stationery supply company is given by,
- $C(x) = 5000 + 2x$

- (i) Find the revenue function. (1 mark)
- (ii) Express the company's profit as a function of  $x$ . (2 marks)
- (iii) Determine the production level that earns the company maximum profit, and find the price for each marker at this level. (4 marks)
- (iv) Find the company's maximum profit. (2 marks)

- (c) Evaluate the integral
- $\int_1^2 (3x^4 + x^2 - 5) dx$
- . (5 marks)

- (d) Given that
- $x, x + 3, 4x, \dots$
- are the first three terms of an arithmetic progression. Find the value of
- $x$
- . (3 marks)

## Question 4

- (a) A zero-coupon (noninterest-bearing) bond can be redeemed in 10 years for RM 1,000. How much should you be willing to pay for it now if you want a return of
- (i) 8% compounded monthly? (3 marks)
- (ii) 7% compounded continuously? (3 marks)
- (b) Dr Ravin bought a house for RM 560,000. He made a 10% down payment and financed the balance through a bank for 30 years.
- (i) If ~~the interest rate~~ was 7.5% compounded monthly, find the monthly payment that Dr Ravin ~~made~~ to settle the loan. (4 marks)
- (ii) Suppose Dr Ravin missed the first three payments. How much should be paid on the fourth month if he wanted to settle the outstanding arrears? (3 marks)

- (iii) Immediately after paying for 10 years, Dr Ravin wants to settle the loan in full. How much is the amount that needs to be paid? (3 marks)
- (c) Given the first term of a geometric progression is 0.8 and the fifth term is 500, Find the 7<sup>th</sup> term of the progression. (4 marks)

### Question 5

- (a) Given matrix  $A = \begin{pmatrix} -2 & 0 \\ 4 & -1 \end{pmatrix}$  and  $B = \begin{pmatrix} 7 & 3 \\ -5 & 6 \end{pmatrix}$ .
- (i) Find  $2B + A^T$  (3 marks)
- (ii) Find  $2BA$  (3 marks)

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

$$\begin{aligned} 4x - 3y &= 15 \\ 2x + y &= 5 \end{aligned}$$

(4 marks)

- (c) The revenue and cost function in ringgit of a product are given as:

$$\begin{aligned} R(x) &= 600x - x^2 \\ C(x) &= 200 + 6x + 2x^2 \end{aligned}$$

Determine the break even quantity. (5 marks)

- (d) Find the amount to be invested every three months at 10% compounded quarterly to accumulate RM 10,000 in three years. Find the interest earned. (5 marks)

### Question 6

- (a) If  $P = 3x + 2y$ , find the maximum value of  $P$  subject to the given constraints:

$$\begin{cases} 2x + y \leq 6 \\ x \leq 2 \\ 2x + 3y \leq 12 \\ x \geq 0, y \geq 0 \end{cases}$$

(6 marks)

(b) The table below shows the sales of a toy robot over the last 11 months.

Month	1	2	3	4	5	6	7	8	9	10	11
No. of sales	365	401	387	350	330	310	298	310	320	345	350

- (i) Use a three-month moving average for the department store sales to forecast for the month 9 and thus find the forecast error for the month 9. (3 marks)
- (ii) Use a five-month moving average for the department store sales to forecast for the month 12. (2 marks)
- (c) Find the relative maximum and relative minimum of the function  $f(x) = x^3 - 3x^2$ . (6 marks)
- (d) Find the inverse of  $A = \begin{bmatrix} 2 & -3 \\ 4 & -5 \end{bmatrix}$ . (3 marks)

~THE END~  
MAT1106(F) August 2015

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 sequances:*

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

