UNIVERSITI UTARA MALAYSIA
FINAL EXAMINATION
FIRST SEMESTER SESSION 2008/2009

CODE/COURSE : QQM1023/ MANAGERIAL MATHEMATICS
DATE : 10 NOVEMBER 2008 (MONDAY)
TIME : 2:30 – 4:30 P.M. (2 HOURS)
VENUE : DMS, DTSO, TE, DSB K.T/WD, DSB K.MAS, DSB K.TM,
KYM, ACT, IKIP, NEGERI, KTB

INSTRUCTIONS:
1. This book script contains THIRTEEN (13) questions in ELEVEN (11) printed pages excluding the cover page.
2. Answer ALL the questions in the space provided.

MATRIC NO: ___________________________ (in words) (in numbers)

IDENTITY CARD/PASSPORT NO: ___________________________

LECTURER: ___________________________

GROUP : __________________________ TABLE NO: __________________________

DO NOT OPEN THE PAGE UNTIL YOU ARE TOLD TO DO SO

CONFIDENTIAL
QUESTION 1 (6 MARKS)

Solve for \( x \)

\( \text{i) } 3^{2x-5} = 27 \)

(3 marks)

\( \text{ii) } \log x = \log 3 + 2 \log 4 \)

(3 marks)

QUESTION 2 (4 MARKS)

If RM 400 is invested for 2 years at 6% compounded semiannually, find the compound amount.
QUESTION 3 (8 MARKS)

Based on the above graph,

i) Find
   a. \( \lim_{{x \to 0^{-}}} f(x) = \)  
      (1 mark)
   b. \( \lim_{{x \to 1}} f(x) = \)  
      (1 mark)
   c. \( \lim_{{x \to -\infty}} f(x) = \)  
      (1 mark)

ii) Find \( \lim_{{x \to 3}} \frac{2x^2 - 4x + 3}{x - 3} \)  
    (2 marks)
iii) \[ \lim_{{x \to 0}} \frac{2x^2 - x + 1}{3x^2 + 1} = \] 

(3 marks)

QUESTION 4 (3 MARKS)

If \( f(x) = 1 - 3x^2 \), find \( f'(x) \) by using the first principle differentiation method.

(3 marks)
QUESTION 5 (10 MARKS)

Find the $f'(x)$ or $\frac{dy}{dx}$ for the following functions:

i. $f(x) = (1-x)^2$  

(ii) $f(x) = x(x-2)(x+4)$  

(iii) $f(x) = \frac{8x^2 - 2x + 1}{x^2 - 5}$  

(iv) $y = \ln(x^2 + 5x)$
QUESTION 6 (6 MARKS)

i. Given $y = e^{-2x}$, find $\frac{d^3 y}{dx^3}$

(3 marks)

ii. Given $y = x(3x^2 - 10x + 7)$, find $\frac{d^2 y}{dx^2}$ when $x = 2$.

(3 marks)
QUESTION 7 (7 MARKS)

i. Given a curve \( y = x^2 - 18x \), find the value of \( x \) at the critical point(s) of this curve and determine the nature of the critical point(s).

(3 marks)

ii. Suppose that \( R(q) = 200q + 40q^2 - q^3 \) is the revenue function for the sales of BFC products where \( q \) is the quantity sold and \( R(q) \) is in unit RM.

a. Find the average revenue function.

(2 marks)

b. When 40 units are sold, how much is the average revenue?

(2 marks)
QUESTION 8 (6 MARKS)

i. $P(q) = -6q^2 + 60q - 48$ is the profit function for a manufacturing company where $q$ is the quantity sold and the profit is in RM thousand. Using the differentiation method, find:

a. the quantity sold that will maximize profit. (4 marks)

b. the maximum profit. (2 marks)

QUESTION 9 (4 MARKS)
Given $f(x, y) = 4y^4 - 2xy^3 + 6x^2$. Find

i. $f_x$ (1 mark)

ii. $f_{xy}$ (1 mark)

iii. $f_{xy}(-3, 1)$ (2 marks)
QUESTION 10 (7 MARKS)

Suppose \(a\) and \(b\) are the two types of chemicals that used in producing washing liquid. The mixture formula function for best cleaning performance of the washing liquid is represented by \(f(a,b) = 30a + b^2\). The cost constraint for both chemicals is \(\frac{1}{2}a + b = 50\).

i. Form the Lagrange function \(F(a,b,\lambda)\) of the problem. \hspace{1cm} (1 mark)

ii. Using Lagrange Multiplier, solve for \(a\) and \(b\). \hspace{1cm} (6 marks)
QUESTION 11 (8 MARKS)

Determine each of the following indefinite integrals:

i. \[ \int x^{-7} \, dx \] (1 mark)

ii. \[ \int \left( \frac{1}{x^3} + e^{x^2} - 10 \right) \, dx \] (2 marks)

iii. \[ \int (9 + x^2)^4 \, dx \] (5 marks)
QUESTION 12 (4 MARKS)

Consider the graph below and evaluate the area between the curves over the stated interval:

\[ y_1 = 7 - x \quad y_2 = 4x - x^2 \]
QUESTION 13 (7 MARKS)

i. Given the demand function for $p = 42 - 5q - q^2$. Assuming that the equilibrium price is RM 6, calculate the consumer surplus. (4 marks)

ii. A manufacturer has determined that the cost function is $C(q) = 11q + 25$ and marginal revenue function is $R(q) = -3q + 30$ where $q$ is the number of units produced. Find revenue function. (3 marks)