

**SULTAN QABOOS UNIVERSITY**  
**DEPARTMENT OF MATHEMATICS AND STATISTICS**  
**May 16 2008**

BUSINESS MATHEMATICS I (MATH1101)

Spring 2009, Final Exam  
(Time allowed: 150 minutes)

**NAME:** \_\_\_\_\_ **ID#:** \_\_\_\_\_ **Section:** \_\_\_\_\_

INSTRUCTIONS: Please read these instructions before you start solving.

- Write your name, ID number and Section number in the first page and ID number at the top of each sheet.
- You need to show your complete, mathematically correct and neatly written work.
- It is prohibited to exchange calculators or share any material during the exam.
- You may use the back side of the page if needed.
- Please keep the sheets stapled.

<b>Question</b>	<b>points</b>	<b>score</b>
<b>Q1</b>	17 pts	
<b>Q2</b>	12 pts	
<b>Q3</b>	16 pts	
<b>Q4</b>	12 pts	
<b>Q5</b>	11 pts	
<b>Q6</b>	10 pts	
<b>Q7</b>	8 pts	
<b>Q8</b>	14 pts	
<b>TOTAL</b>	100 pts	

Solve each of the following questions. In questions **Q1** to **Q7**, you need to show your complete, mathematically correct and neatly written work.

**Q1:**

*(5+4+3+5=17 points)*

(a) Solve each one of the following equations for  $x$ .

$$(i) \left| \frac{-3x - 2}{x + 2} \right| = 5 \quad (ii) (3)^{x^2} = 9^{1-x} \quad (iii) \begin{vmatrix} 1 & 0 & 0 \\ x^2 & x + 3 & 2 \\ x & x & x + 1 \end{vmatrix} = 3.$$

(b) Solve the inequality  $3 + 2|3 - 2x| < 7$  and write your solution set in interval form.

- 3 -

**Q2:***(4+4+4=12 points)*

- (a) Find the domain of  $f(x) = \frac{1}{\sqrt{x^2-5x-6}}$ .
- (b) Find the domain and range of  $g(x) = 2 + e^x$ .
- (c) Find the inverse of  $g(x) = 2 + e^x$ .

**Q3:***(3+4+5+4=16 points)*

- (a) Find the equation of the circle whose radius is 3 that lies in the first quadrant and touches both axes.
- (b) Determine the maximum or minimum value of the function  $f(x) = 2x^2 + x - 5$ .
- (c) Find the equation of the line passing through (1, 2) and is parallel to  $4x - 2y = -3$ .
- (d) Find the  $x$  and  $y$  intercepts of the line  $4x - 2y + 3 = 0$ .

- 4 -

**Q4:** Given the system of linear equations*(2+1+5+4=12 points)*

$$\begin{aligned}x - 2y &= 2 \\ -x + 2z &= 2 \\ 2y - z &= 0\end{aligned}$$

- (a) Write the above system in the form  $AX = B$ .
- (b) Write the augmented matrix of the system.
- (c) Use the method of row reduction to solve the system.
- (d) Use Cramer's rule to find the  $x$  value.

- 5 -

**Q5:** Consider the matrix*(5+3+3=11 points)*

$$A = \begin{bmatrix} 2 & -3 & 0 \\ 1 & 4 & 3 \\ -5 & 6 & 0 \end{bmatrix}$$

- (a) Find the adjoint of the matrix  $A$ .
- (b) Evaluate the determinant of  $A$ .
- (c) Is the matrix  $A$  invertible? If yes, find  $A^{-1}$ .

**Q6:**

*(4+6=10 points)*

- (a) Suppose that 1000 R.O. is invested at a 6% compounded semi-annually, how long does it take to increase the investment to 3000 R.O.

- (b) A dealer can sell 200 units of certain commodity per day at 30 R.O. and 250 units at 27 R.O. per day. The supply equation for that commodity is  $6p = x + 48$ . Find the demand equation assuming it to be linear, then find the equilibrium price and quantity.

**Q7:**

*(4+4=8 points)*

A manufacturer can sell  $x$  units of a product each week at a price of  $p$  Rials per unit, where  $p = 200 - x$ . It costs  $(2800 + 45x)$  Rials to produce  $x$  units.

(a) How many units should be sold each week to generate a revenue of 9600 Rials?

(b) How many units should the manufacturer produce and sell each week to obtain a profit of 3200 Rials?

**Q8:** Circle the correct choice (You need to circle one choice only, and you are not required to show your complete work). (2 points each)

- (i) The slope of the line  $4x - 2y + 7 = 0$  is  
(a) 2      (b) -2      (c) 4      (d)  $\frac{1}{2}$       (e)  $\frac{-1}{2}$
- (ii) If  $f(x)$  has an inverse, then the graph of  $f^{-1}(x)$  is the reflection of the graph of  $f(x)$  about  
(a)  $x$ -axis  
(b)  $y$ -axis  
(c)  $y=x$   
(d) None of the above.
- (iii)  $x^2 + y^2 - 4x + 6y - 12 = 0$  is a circle whose center and radius are  
(a)  $(-2, -3)$ ,  $r = 25$   
(b)  $(-2, -3)$ ,  $r = 5$   
(c)  $(2, -3)$ ,  $r = 25$   
(d)  $(2, -3)$ ,  $r = 5$   
(e)  $(-2, 3)$ ,  $r = 5$
- (iv)  $\log x^3 - \log y^2$  equals  
(a)  $\frac{3\log x}{2\log y}$   
(b)  $\frac{\log x^3}{\log y^2}$   
(c)  $\log(x^3 - y^2)$   
(d)  $\log \frac{x^3}{y^2}$   
(e) none of the above.
- (v) If  $f(x) = \frac{1}{2-x}$  and  $g(x) = \sqrt{x^2 - 1}$ , then  $f \circ g(\sqrt{2}) =$   
(a) undefined.  
(b) -1  
(c)  $\frac{1}{2-\sqrt{3}}$   
(d) 4  
(e) None of the above.
- (vi) The graph of the function  $f(x) = 3 - 2x^2 + 4x$  is called  
(a) a line  
(b) a circle  
(c) a parabola  
(d) an ellipse
- (vii) The sum of the first 20 terms of  $2 + 7 + 12 + 17 + 22 + \dots$  is  
(a)  $ar^{20}$   
(b) 97  
(c) 102  
(d) 990  
(e) none of the given choices.

**End of Questions**  
**Good Luck**

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