

**UNIVERSITY OF SWAZILAND**

**SUPPLEMENTARY EXAMINATIONS 2010**

**B.A.S.S. I / D.COM I**

**TITLE OF PAPER** : INTRODUCTORY MATHEMATICS FOR BUSINESS

**COURSE NUMBER** : MS 102 AND IDE MS102

**TIME ALLOWED** : THREE (3) HOURS

**INSTRUCTIONS** : 1. THIS PAPER CONSISTS OF  
SEVEN QUESTIONS.  
2. ANSWER ANY FIVE QUESTIONS

**SPECIAL REQUIREMENTS** : NONE

THIS EXAMINATION PAPER SHOULD NOT BE OPENED UNTIL  
PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR.

### QUESTION 1

1. (a) Evaluate the following limits:

(i)  $\lim_{x \rightarrow 2} \frac{x^2 - x - 2}{x - 2}$  [5 marks]

(ii)  $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - 1}{x}$  [5 marks]

(b) Use the **limit definition** of the derivative to find  $f'(x)$  corresponding to the following functions

i.  $f(x) = \frac{1}{x}$  [5 marks]

ii.  $f(x) = 1 + x^2$  [5 marks]

### QUESTION 2

2. Find the derivatives,  $f'(x)$ , of the following functions

(a)  $f(x) = (2x^2 + 1)e^{3x}$  [5 marks]

(b)  $f(x) = \frac{\sin 2x}{1 + e^{x^2}}$  [5 marks]

(c)  $f(x) = \ln \frac{(x^2 + 1)^5}{x^2 - 2x}$  [5 marks]

(d)  $f(x) = x^2 \ln x^2$  [5 marks]

### QUESTION 3

3. (a) A company manufactures and sells  $x$  radios per week. If the weekly cost and price-demand functions are given by

$$C(x) = 5000 + 2x, \quad p = 10 - 0.001x$$

Find the following, for each week.

- (i) the revenue function. [2 marks]
  - (ii) the maximum revenue. [4 marks]
  - (iii) the maximum profit. [4 marks]
  - (iv) the price that will yield maximum profit. [2 marks]
- (b) Sketch the graph of  $y = x^3 - 6x^2 + 9x + 1$ , showing all relative extreme points, inflection points and the  $y$ -intercept. [8 marks]

### QUESTION 4

4. (a) Find the first four (4) derivatives of the function  $y = (2x + 1)^5$ . [8 marks]
- (b) From a thin piece of cardboard that is 12cm by 12cm, square corners are cut out so that the sides can be folded up to make a box. What dimensions will yield a box of maximum volume? [12 marks]

### QUESTION 5

5. Evaluate the following integrals

- (a)  $\int \left( 2x - 3x^2 + \frac{4}{x^3} \right) dx$  [5 marks]
- (b)  $\int x^2 e^x dx$  [5 marks]
- (c)  $\int \left( \frac{5x - 7}{x^2 - 2x - 3} \right) dx$  [5 marks]
- (d)  $\int x^2 (2x^3 + 1)^4 dx$  [5 marks]

QUESTION 6

6. (a) Find the area of the region bounded by the parabola  $y = -x^2 - 6x$  and the line  $y = 0$  [8 marks]
- (b) Find the equation of the curve that passes through (2,5) if its slope is given by  $\frac{dy}{dx} = 2x$  at any point  $x$ . [6 marks]
- (c) If the marginal cost of producing  $x$  units is given by

$$C'(x) = 0.3x^2 + 2x$$

and the fixed cost is E2000, find the cost function  $C(x)$  [6 marks]

QUESTION 7

7. Given the demand function  $D(x) = 20 - 0.05x$  and the supply function  $S(x) = 2 + 0.0002x^2$ , find

- (a) the equilibrium price. [6 marks]
- (b) the consumer's surplus [7 marks]
- (c) the producer's surplus [7 marks]