

**UNIVERSITY OF SWAZILAND**

**SUPPLEMENTARY EXAMINATIONS 2008**

**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)  $\lim_{x \rightarrow \infty} \frac{2 - x^2}{2x^2 + x - 1}$  [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  $f'(x)$ ,  
where  $f(x) = \sqrt{x}$  [5 marks]

QUESTION 2

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

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

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

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

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

QUESTION 3

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

$$C(x) = 1000 + 450x, \quad p = 2000 - 5x$$

Find the following, for each week.

(a) the revenue function. [3 marks]

(b) the profit function. [3 marks]

(c) the maximum revenue. [6 marks]

(d) the maximum profit. [6 marks]

(e) the price that will yield maximum profit. [2 marks]

QUESTION 4

4. (a) Find the first four (4) derivatives of the function  $y = x \ln x$ . [8 marks]

(b) Suppose that the cost for a company to produce  $x$  pairs of a new line of jeans is

$$C(x) = 2000 + 3x + 0.01x^2 + 0.0002x^3$$

- i. Find the marginal cost function. [3 marks]
- ii. Find the marginal cost of manufacturing 100 pairs of jeans and interpret the result. [3 marks]
- (c) Find the interval where the function  $y = x^3 - 6x^2 + 9x + 1$  is decreasing, increasing and stationary. [6 marks]

QUESTION 5

5. Evaluate the following integrals

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

(b)  $\int x^2 \sin x dx$  [5 marks]

(c)  $\int \left( \frac{5x - 7}{x^2 - 2x - 3} \right) dx$  [5 marks]

(d)  $\int 12x^2(2x^3 + 1)^4 dx$  [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. Consider the market characterized by the demand and supply functions

$$D(x) = 0.1x^2 + 2x + 20 \quad \text{and} \quad S(x) = 40 - x - 0.1x^2$$

respectively. Find

- (a) the price  $p^*$  and the number of units  $x^*$  at market equilibrium. [10 marks]
- (b) the producer's surplus [10 marks]