

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]