UNIVERSITY OF SWAZILAND

FINAL EXAMINATIONS 2008/2009

B.A. Hums. / B.A.S.S. I

TITLE OF PAPER	:	ELEMENTARY QUANTITATIVE TECHNIQUES
COURSE NUMBER	:	MS 012
TIME ALLOWED	:	THREE (3) HOURS
INSTRUCTIONS	:	1. THIS PAPER CONSISTS OF SEVEN QUESTIONS.
		2. ANSWER ANY FIVE QUESTIONS
		3. ONLY NON-PROGRAMMABLE CALCULATORS MAY BE USED.
SPECIAL REQUIREMENTS	:	NONE

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

QUESTION 1

(a) Use the limit definition of the derivative to find $f'(x)$ of;

(i) $f(x) = \frac{1}{x}$ [6 marks]

(ii) $f(x) = \sqrt{x}$ [7 marks]

(b) If $y = (ax + 2)^2$ and $\frac{d^2y}{dx^2} = 18$, find the value(s) of a.   [7 marks]

QUESTION 2

(a) Given the function $f(x) = 3x^2 + 2$, evaluate;

(i) $f(-2)$ [3 marks]

(ii) $f(x + h)$ [3 marks]

(iii) $f^{-1}(x)$ [4 marks]

(b) The cost, C, of making x articles per day is $E(\frac{1}{3}x^3 + 60x + 60)$ and the selling price, p, of each one is $E(100 - \frac{3}{2}x)$. Find

(i) the daily profit in terms of x,   [5 marks]

(ii) the value of x to give the maximum profit.   [5 marks]

QUESTION 3

Evaluate the following integrals;

(a) $\int_0^1 (x^5 - 3x^2 + 4)dx$ [4 marks]

(b) $\int \dfrac{\ln x}{x}dx$ [6 marks]

(c) $\int 2xe^{x^2}dx$ [4 marks]

(d) $\int 2x\cos(x^2 + 3)dx$ [6 marks]

QUESTION 4

For the polynomial, $f(x) = x^3 - 2x^2 - 5x + 6$,

(a) given that one root is -2, find the other roots and then
express the polynomial as a product of its factors.   [5 marks]

(b) Find the $x-$ and the $y-$ intercept(s) of $f(x)$.   [3 marks]

(c) Find the coordinates of the turning points of $f(x)$.   [8 marks]

(d) Hence or otherwise sketch the graph of $f(x)$.   [4 marks]

QUESTION 5

Evaluate the limit for each of the following functions;

(a) $\lim_{x \to -3} x^3 - 2x + 6$ [4 marks]

(b) $\lim_{x \to 2} \dfrac{2x^2 + 4}{4x^3 + 2}$ [4 marks]

(c) $\lim_{x \to 1} \dfrac{x^2 - 1}{x - 1}$ [6 marks]

(d) $\lim_{x \to \infty} \dfrac{x^2 + x - 2}{4x^3 - 1}$ [6 marks]

QUESTION 6

Find the first derivative for each of the following functions below;

(a) $f(x) = \ln(\sqrt{3 - x^2})$ [7 marks]

(b) $h(x) = e^{5x}$ [3 marks]

(c) $g(x) = (3x - x^3 + 1)^3$ [5 marks]

(d) $y = (2x + 1)(x^2 - 7)$ [5 marks]

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QUESTION 7

(a) An AP is given by $k, \frac{2k}{3}, \frac{k}{3}, 0, \ldots$.

(i) Find the sixth term. [3 marks]

(ii) Find the n th term. [3 marks]

(iii) If the 20th term is equal to 15, find k. [3 marks]

(b) The sum of the first 20 terms of an arithmetic series is identical to the sum of the first 22 terms. If the common difference is -2, find the first term. [6 marks]

(c) How many terms are there in the geometric progression

$$2, 4, 8, \ldots, 128?$$

[5 marks]

END OF EXAMINATION