# UNIVERSITY OF SWAZILAND

## Final Examination 2005

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| **Title of Paper** | : | Elementary Quantitative Methods |
| **Program** | : | B.A. Hums./B.A.S.S. I |
| **Course Number** | : | MS 001 (ii) |
| **Time Allowed** | : | Three (3) Hours |
| **Instructions** | : | 1. This paper consists of SEVEN questions on THREE pages. |
| | | 2. Answer any five (5) questions. |
| | | 3. Non-programmable calculators may be used. |

**Special Requirements:** GRAPH PAPER

THIS EXAMINATION PAPER MAY NOT BE OPENED UNTIL PERMISSION TO DO SO IS GRANTED BY THE INVIGILATOR.

## Question 1

(a) Find the equation of a straight line that passes through the point $(3, 4)$ and is perpendicular to the line $y + 2x = 5$.                    **[8 marks]**

(b) Use long division to find the remainder when $5x^2 + 2x + 1$ is divided by $x + 4$.                    **[12 marks]**

## Question 2

Given the function $f(x) = -x + 4$, evaluate

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

(ii) $f(x + h)$                    **[4 marks]**

(iii) $f^{-1}(x)$                    **[5 marks]**
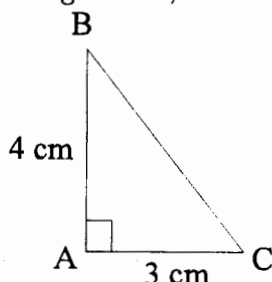
(iv) $f'(x)$ using the definition of a derivative.                    **[8 marks]**

## Question 3

(a) From the given triangle ABC, find as fractions

(i) $\sin A\hat{B}C$,                    **[2 marks]**

(ii) $\cos B\hat{C}A$,    4 cm                    **[2 marks]**

(iii) $\tan A\hat{B}C$.                    **[2 marks]**

B

A ⌐ C
3 cm

(b) Solve the trigonometric equation $2\sin x = 1$ for $O^o \geq x \geq 360^o$                    **[6 marks]**

(c) Prove the identity

$$(1 + \tan^2 \theta)(1 - \sin^2 \theta) \equiv 1$$

**[8 marks]**

## Question 4

(a)Find $f^1(x)$ for the following functions

   (i) $f(x) = x^4 + 3x^2 + x + 2$

                                                   **[3 marks]**

   (ii) $f(x) = (3x^2 + 1)^8$

                                                   **[4 marks]**

(b) The cost of making $x$ articles per day is $E(\frac{1}{2}x^2 + 50x + 50)$ and the selling price of each one is $E(80 - \frac{1}{4}x)$. Find

   (i) the daily profit in terms of $x$,

                                                   **[5 marks]**

   (ii) the value of $x$ to give the maximum profit.

                                                   **[8 marks]**

## Question 5

(a) Evaluate the following integrals

   (i) $\int (x^3 + 2x^2 + 4)\ dx$

                                                   **[4 marks]**

   (ii) $\int_{-2}^{0} (x^2 + 5x - 1)\ dx$

                                                   **[6 marks]**

   (iii) $\int \sqrt{x+1}\ dx$

                                                   **[4 marks]**

(b) Find the area enclosed by the curve $y = 3x - x^2$, the $x$-axis and the lines $x = -1$, $x = 2$.

                                                   **[6 marks]**

## Question 6

(a) Solve the equation

$$x^3 + 6x^2 + 11x + 6 = 0$$

**[10 marks]**

(b) Use the remainder theorem to find the remainder when $x^3 + 2x^2 + 2$ is divided by $x + 1$.

**[4 marks]**

(c) Show that the equation $a^2x^2 + ax + 1 = 0$ can never have real roots.

**[6 marks]**

## Question 7

(a) Evaluate the following limits

(i) $\lim_{x \to 2}(3x + 4)$

**[2 marks]**

(ii) $\lim_{x \to 2} \dfrac{x^2 - 4}{x - 2}$

**[5 marks]**

(b) Draw the graph of $y = x^2 + x - 2$ for values of $x$ between $-4$ and $3$ using a scale of 1 cm to represent 1 unit on the vertical axis, and 2 cm to represent 1 unit on the horizontal axis.

**[3 marks]**

Use the graph to solve

(i) $x^2 + x - 2 = 0$,

**[4 marks]**

(ii) $x^2 + x = 2x + 2$.

**[6 marks]**

******** *END OF EXAMINATION* ********