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UNIVERSITY OF SWAZILAND

Supplementary Examination 2005

Title of Paper : Elementary Quantitative Methods

Program : B.A.S.S./B.A.(Hums.) 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 $(2, -3)$ and is parallel to the line $2y - 4x = 5$. **[8 marks]**

(b) Use long division to find the remainder when $3x^2 - 2x + 5$ is divided by $x + 1$. **[12 marks]**

Question 2

Given the function $f(x) = 2x + 1$, 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) In a triangle ABC, $B\hat{A}C = 90^o$, $AB = 12$ cm, and $AC = 5$ cm. Find as fractions

(i) $\sin A\hat{B}C$,

[2 marks]

(ii) $\cos B\hat{C}A$,

[2 marks]

(iii) $\tan A\hat{B}C$.

[2 marks]

(b) Solve the trigonometric equation $2\cos x = 1$ for $O^o \leq x \leq 360^o$.

[6 marks]

(c) Prove the identity

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

[8 marks]

Question 4

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

(i) $f(x) = 3x^5 - 2x^3 + x^2 + 1$

[3 marks]

(ii) $f(x) = (x^2 + 1)^9$

[4 marks]

(b) The cost of making x articles per day is E$(\frac{1}{3}x^3 + 60x + 60)$ and the selling price of each one is E$(90 - \frac{3}{2}x)$. Find

(i) the daily profit in terms of x,

[5 marks]

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

[8 marks]

Question 5

(a) Evaluate the following integrals

(i) $\int (x^5 - 3x^2 + 4)\ dx$

[4 marks]

(ii) $\int_{-1}^{1} (x^2 + 3x - 1)\ dx$

[6 marks]

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

[4 marks]

(b) Find the area enclosed by the curve $y = 2x - x^2$, the x-axis and the lines $x = 0$, $x = 1$.

[6 marks]

Question 6

(a) Solve the equation

$$x^3 + 2x^2 - x - 2 = 0$$

[10 marks]

(b) Use the remainder theorem to find the remainder when $3x^3 + x^2 - 2$ 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) $\lim_{x \to -2}(x + 5)$

[2 marks]

(ii) $\lim_{x \to 3} \dfrac{x^2 - 9}{x - 3}$

[5 marks]

(b) Draw the graph of $y = x^2 - x - 2$ for values of x between -3 and 4 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* ********