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Uva Wellassa University, Sri Lanka
Faculty of Science and Technology
Science and Technology Degree program
1st Semester Examination – March/ April 2013

Uva Wellassa University

SCT 103-0 Basic Calculus

Instructions to candidates
Number of Questions: 04
Answer all questions
Time allocation: Two (02) hours
Total marks allocated: 100

1.

a. Factor each of the following.

i. $14x^3 - 6x$

ii. $x^2 - 5x + 6$

iii. $9x^2 - 4x^2$

iv. $4m^2 - 12mn + 9n^2$

b. Simplify the following.

i. $\frac{x^2-4}{x-2}, \quad x \neq 0$

ii. $\frac{x^2-6x+9}{x^2-9} \; x \neq \pm 3$

iii. $\left(\frac{a}{b} - \frac{b}{a}\right) \div \left(\frac{a}{b} + 2 + \frac{b}{a}\right)$

iv. $\frac{12x^2y}{4xy+8y} \times \frac{x^2-4}{3x^2-6}$

c. By using matrices or otherwise solve the following simultaneous equations.

i. $y - 2x = 8; \quad y - 3x = 5$

ii. $4x + 3y = 15; \quad 2x - 3y = 3$

(25 marks)

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2.

a. Determine whether each of the followings is a function.

i. Domain =[-∞, ∞]; Range =[-∞, ∞]; $y=5x+2$

ii. Domain =[-∞, ∞]; Range =[-∞, ∞]; $y^2=3x^2+2x+1$

b. The function $f(x) = 2x^2 - 5x + 3$ is given. Find each of the following.

i. $f(0)$ ii. $f(-1)$ iii. $f(5)$

c. Find the Domain and the Rage of the following. Use interval notation where it is applicable.

i. $f(x) = 4x + 3$

ii. $g(x) = \sqrt{6 + 5x}$

(25marks)

3.

a. Find each of the following limit.

i. $\lim_{x \to 2}(2x^2 + 5x - 9)$

ii. $\lim_{x \to 3}\left(\frac{x^3-9}{x-3}\right)$

iii. $\lim_{t \to \infty}\left(\frac{2t+3}{4t-1}\right)$

iv. $\lim_{x \to 3}(2x^4 - x^2 - 8x + 1)$

b. Determine whether the following function are continuous at the given point *c*.

i. $f(x) = 2x + 1$; $c=2$

ii. $f(x) = \frac{x^2-1}{x+1}$; $c=-1$

c. The function $f(x) = \begin{cases} x^2 + 2 & \text{if } x > 1 \\ 3 & \text{if } x = 1; \\ x + 2 & \text{if } x < 1 \end{cases}$ is given.

i. Sketch the function.

ii. Evaluate $\lim_{x \to 1} f(x)$

iii. Find $f(1)$

iv. Is f continuous at x=1?

4.

a. State the limit definition for the derivative of the function f(x).

b. Differentiate each of the following functions with respect to x.

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

ii. $f(x) = (2x + 3)(x + 1)$

iii. $f(x) = (x^2 + 2x + 1)^2$

iv. $f(x) = \frac{2x}{cosx+1}$

c. A dynamite blast propels a heavy rock straight up with an initial velocity of 60 ms^{-1}. It reaches a height of $S(t)$=$60t - 5t^2$ meters after t seconds.

i. Find the velocity after t seconds.

ii. How high does the rock go?

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