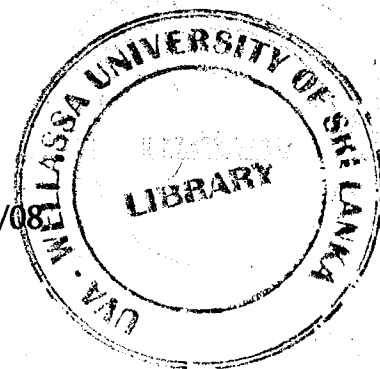


Uva Wellassa University, Sri Lanka
 BSc in Export Agriculture Degree Programme - 2007/08
 BSc Degree Programme
 End Semester Examination - Semester II
 June/July - 2008



AAS 1201-2 Mathematics for Biological Sciences

Answer all questions
 Time: Two (2) Hours

(1) (i) Simplify the following terms

(a) $\left(\frac{64a^3}{125b^3}\right)^{-1/3}$

(b) $\log_a a^9 - \log_a a^8$; where $a > 0$ & $a \neq 1$

(ii) Show that

$$a^x = e^{x \ln a} \quad ; \text{ where } a > 0$$

(iii) Solve the equation

$$3 \times 9^{2x-1} = 27^{-x}$$

(2) (i) Find the derivative of functions given below with respect to x

(a) $y = x^4 - 3x^3 + 2x - 1$

(b) $y = x^2 \sin x$

(c) $y = \sin(x^2)$

(ii) A graphic artist designing a poster, which is to have margins of 2 inches at the top, left and right sides, and 3 inches at the bottom. In order to save expenses, artist wants the total area of the poster to be as small as possible, but the printed area (the part inside the margins) has to be 180 square inches. What dimensions will minimize the total area?

(iii) Evaluate $\int_{-1}^0 (2x - e^x) dx$

(3) (i) Let the matrices

$$A = \begin{pmatrix} 10 & 12 \\ 15 & 8 \end{pmatrix}_{2 \times 2}$$

and

$$B = \begin{pmatrix} 1 & 0 & 2 \\ 0 & -1 & 0 \end{pmatrix}_{2 \times 3}$$

Then find,

(a) $A + 2I$

(b) AB

(c) A^{-1}

- (ii) A farmer feeds cattle using a mixture of two feed types. One standard unit of feed type A supplies a steer with 10% of its minimum daily requirement of protein and 15% of its requirement of carbohydrates. Feed type B contains 12% of the requirement of protein and 8% of the requirement of carbohydrates in a standard unit. If the farmer wishes to feed cattle exactly 100% of their minimum daily requirement of protein and carbohydrates, how many units of each type of feed should he give a steer each day?

(Hint: use part (c) of above question)

(4) (i) Let $f(x, y) = \sqrt{x + y} + x \tan y$

Then find,

(a) $\frac{\partial f}{\partial x}$

(b) $\frac{\partial f}{\partial y}$

- (ii) Suppose paddy yield (in kilograms) from one acre depend on fertilizer and water according to following equation.

$$f(x, y) = 1.5(x + 10) + \frac{7}{180}yx$$

Here x is amount of fertilizer (in kilograms) and y is amount of water (in liters).

- (a) Find the paddy yield for 250 kg of fertilizer and 18000 l of water?
(b) Without fertilizer and water is there any yield? If so find that yield?
(c) Find the change of yield per kilogram of fertilizer when 200 kg fertilizer and 15000 l water applied to paddy as inputs?
(d) Find the change of yield per liter of water when 200 kg fertilizer and 15000 l water applied to paddy as inputs?
(e) Comparing part (c) and (d) state which input increases give high yield?

