



EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS
FIRST EXAMINATION IN SCIENCE - 2010/2011
FIRST SEMESTER (Nov./Dec., 2012)
CC 103 - BIO MATHEMATICS
(PROPER & REPEAT)

Answer all Questions

Time: One hour

1. (a) Simplify each of the following:

i. $\left(\frac{3a^2b^2c}{4bc^2}\right) \times \left(\frac{5b^3c^2a}{6ac}\right) \div \left(\frac{3ab^2}{7a^2bc^3}\right);$
ii. $\left(\frac{81}{16}\right)^{-1/4} \times \frac{9}{4} \times \frac{1}{(256)^{1/4}};$
iii. $\frac{\sqrt[5]{32x^{-10}y^5}}{\sqrt{x^{-4}y^2 + x^{-2}y}}.$

(b) Solve the following equations:

i. $4 \times 8^{2x-1} = 32^{x+1};$
ii. $\log_4 \sqrt{5x+3} - \frac{1}{2} = \log_4 \sqrt{x+1};$
iii. $3^{2x} - 4 \times 3^{x+1} + 3^3 = 0.$

- (c) i. Show that if $p = q^{2a}$, $q = r^{2b}$ and $r = p^{2c}$, then $abc = \frac{1}{8}$.
ii. If $a^2 + b^2 = 11ab$, then show that $2 \log \left(\frac{a-b}{3}\right) = \log a + \log b.$

2. (a) Find the values of the following:

i. $\lim_{x \rightarrow 1} \frac{\sqrt{2-x}-1}{2-\sqrt{x+3}};$
ii. $\lim_{x \rightarrow \infty} \frac{8x^{10} - 4x^6 + 3x - 12}{4x^{10} + 2x^8 - 3x^2 + 5x}.$

- (b) i. Differentiate the function $y = \sqrt{\frac{x^2 - 1}{x^2 + 1}}$ with respect to x .
 ii. Find the maximum and minimum points, if exist, of the function

$$y = 4x^3 + 9x^2 - 12x + 13.$$

- (c) Find the following integrals:

i. $\int x^2 e^{\frac{2}{3}x} dx;$
 ii. $\int \frac{2x + 1}{3x^2 + 4x + 1} dx.$

Type: One page

Answer all Questions

I. Simplify and then add to those given below (a)

$$\left(\frac{3ab^2}{a^2b^2c^2} \right) + \left(\frac{a^2b^2c}{abc^2} \right) \times \left(\frac{3a^2b^2c}{4abc^2} \right) \\ = \frac{1}{abc^2} \times \frac{3}{4} \times \left(\frac{18}{16} \right) \\ = \frac{9}{8} \times \frac{1}{abc^2}$$

(b) Solve the following equations:

$$x^2 + 8x - 9 = 0 \Rightarrow x = -8 \pm \sqrt{64 + 36} = -8 \pm 10$$

$$(1 + 3\sqrt{10})x = \frac{1 + 3\sqrt{10}}{1 - 3\sqrt{10}} \text{ and } x = \frac{1 + 3\sqrt{10}}{(1 - 3\sqrt{10})(1 + 3\sqrt{10})}$$

$$x = \frac{1 + 3\sqrt{10}}{1 - 90} = \frac{1 + 3\sqrt{10}}{-89} = -\frac{1 + 3\sqrt{10}}{89}$$

$\frac{1}{2} \sin^{-1} 2x = \pi \Rightarrow \sin^{-1} 2x = \pi \Rightarrow 2x = \pi \Rightarrow x = \frac{\pi}{2}$ and $x = \frac{\pi}{2}$ (c)

$$3\cot x + 2\cot x = \left(\frac{5}{2}\right) \text{ and } \cot x = \frac{5}{2} \Rightarrow x = \tan^{-1} \left(-\frac{2}{5}\right) \text{ and } x = \tan^{-1} \left(\frac{2}{5}\right)$$

II. Simplify and then add to those given below (d)

$$\frac{1 - x - \sqrt{1 - 2x + x^2}}{x^2 - 3x + 2} \\ = \frac{1 - x - \sqrt{(1 - x)^2}}{(x - 1)(x - 2)} \\ = \frac{1 - x - (1 - x)}{(x - 1)(x - 2)} \\ = \frac{1 - x - 1 + x}{(x - 1)(x - 2)} \\ = \frac{0}{(x - 1)(x - 2)} = 0$$