



EASTERN UNIVERSITY, SRI LANKA

DEPARTMENT OF MATHEMATICS

FIRST EXAMINATION IN SCIENCE - 2009/2010

FIRST SEMESTER (June/July, 2011)

CC 103 - BIO MATHEMATICS

(Proper & Repeat)

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Answer all questions

Time : One hour

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1. (a) Simplify each of the following:

i.  $\frac{5x^{-1}y^{-4}}{(3y^5)^{-2}x^9}$ ;

ii.  $\left(\frac{x^2 - xy}{xy + y^2} \div \frac{x^2 - y^2}{x^2 + 2xy + y^2}\right) \div \left(\frac{x^2 - 2xy + y^2}{x^2y - xy^2}\right)$ ;

iii.  $\left(\frac{27}{8}\right)^{-1/3} \times \frac{9}{4} \times \frac{1}{(64)^{1/3}}$ .

(b) Solve the following equations:

i.  $\sqrt{1+x^2} + \sqrt{1-x^2} = 3\sqrt{1+x^2} - 3\sqrt{1-x^2}$ ;

ii.  $4^{5-9x} = \frac{1}{8^{x-2}}$ ;

iii.  $2\log_9(\sqrt{x}) - \log_9(6x-1) = 0$ .

(c) Prove that  $\log_a mn = \log_a m + \log_a n$ , where  $m, n$  are positive integers. Hence show that

$$2\log(x+y) = 2\log x + \log\left(1 + \frac{2y}{x} + \frac{y^2}{x^2}\right).$$

2. (a) Find the limit value of the following:

i.  $\lim_{x \rightarrow \infty} \sqrt{x^2 + 3x} - x;$

ii.  $\lim_{x \rightarrow 2} \frac{x^2 - 4x + 4}{x - 2}.$

(b) i. Find the points on the graph of  $f(x) = \frac{x^2 - 4}{x^2 + 4}$ , where the tangent line is horizontal.

ii. Find  $\frac{d^2y}{dx^2}$ , if  $y = x \tan\left(\frac{1}{x}\right).$

(c) Integrate the following:

i.  $\int x^2 e^x dx;$

ii.  $\int \frac{5x - 10}{x^2 - 3x - 4} dx.$

(d) Evaluate  $\int_0^{\frac{\pi}{2}} \sin 2x dx.$