
University of Swaziland



Supplementary Examination – 2011/12

Diploma in Environmental Health Sciences I

Title of Paper : Calculus for Health Sciences

Course Number : EHM107

Time Allowed : Two (2) hours

Instructions :

1. This paper consists of SIX questions.
2. Each question is worth 25%.
3. Answer ANY FOUR questions.
4. Show all your working.

THIS PAPER SHOULD NOT BE OPENED UNTIL PERMISSION HAS
BEEN GIVEN BY THE INVIGILATOR.

Question 1

(a) Evaluate

(i) $\lim_{t \rightarrow 1} \frac{t^2 - 1}{t + 1}$ [4 marks]

(ii) $\lim_{x \rightarrow 0} \frac{1 + \sin x}{1 + \cos x}$ [3 marks]

(b) Differentiate

(i) $H(v) = \frac{v^5 - 2v^3 + 3}{v^2}$ [4 marks]

(ii) $F(u) = \frac{u}{u - 1}$ [7 marks]

(c) Integrate

$$\int_1^4 \frac{3}{\sqrt{x}} \, dx. \quad [7 \text{ marks}]$$

Question 2

(a) Differentiate

(i) $H(x) = 2x - \frac{1}{2x} + 3$ [4 marks]

(ii) $F(x) = 4 + \sin 2x - e^{-x}$ [4 marks]

(b) Use the limit definition to find $f'(x)$ given

$$f(x) = x^2 + 5. \quad [8 \text{ marks}]$$

(c) Evaluate

$$\int \frac{2x}{(x^2 + 5)^2} \, dx. \quad [9 \text{ marks}]$$

Question 3

(a) For the function

$$y = x^3 - 3x,$$

find

- i. the intervals in which the graph is increasing/decreasing [3 marks]
- ii. intervals in which the graph is concave up/down [3 marks]
- iii. stationary points and classify them [3 marks]
- iv. inflexion points [3 marks]

Hence make a sketch of the graph of y . [5 marks]

(b) Integrate

- i. $\int \left(\frac{1}{x} - \frac{3}{x^2} - 6 \right) dx$ [4 marks]
 - ii. $\int_{-2}^2 t^2 \left(t - \frac{2}{t^3} \right) dt$ [4 marks]
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Question 4

(a) Integrate

i. $\int_0^1 (3x^2 + 2x + 3) dx$ [4 marks]

ii. $\int (x + 1)^2 dx$ [4 marks]

(b) A retail shop has determined that the price-demand function for one of its blank DVDs is

$$p = 10 - 0.001x,$$

where p is the unit selling price and x is the number of units sold per week. If the cost of each DVD is E2 while the weekly fixed costs stand at E5,000, find the most profitable number of units to sell each week.

[17 marks]

Question 5

(a) Find the indicated derivatives:

i. $R(x) = \ln(\sec x),$ R' [2 marks]

ii. $H(v) = x^3 \ln x,$ H''' [8 marks]

(b) Evaluate

$$\lim_{x \rightarrow \infty} \frac{2x + 1}{4 + 2x - x^2}.$$

[5 marks]

(c) Find the area of the region enclosed by the curves

$y = x^2$ and $y = 9.$ [10 marks]

Question 6

(a) Differentiate and simplify

i. $G(X) = 6X^{\frac{4}{3}} + 15X^{-\frac{2}{5}}$ [3 marks]

ii. $y = \frac{\cos x}{1 - \sin x}$ [6 marks]

(b) Integrate

$$\int x \cos 2x \, dx$$
 [8 marks]

(c) Use partial fractions to integrate

$$\int \frac{x}{(x+2)(x-6)} \, dx.$$
 [8 marks]
