



UNIVERSITY OF SWAZILAND
Faculty of Health Sciences

DIPLOMA IN ENVIRONMENTAL HEALTH YR 1

B.Sc ENVIRONMENTAL HEALTH YR 4

SUPPLEMENTARY EXAMINATION PAPER JULY 2010

TITLE OF PAPER	:	CALCULUS FOR HEALTH SCIENCES
COURSE TITLE	:	HSM 115
DURATION	:	2 HOURS
MARKS	:	100
INSTRUCTIONS	:	READ QUESTIONS & INSTRUCTIONS CAREFULLY
	:	ANSWER ANY FOUR (4) QUESTIONS
	:	EACH QUESTION CARRIES 25 MARKS
	:	WRITE NEATLY & CLEARLY
	:	SHOW ALL YOUR WORKING
	:	NO PAPER SHOULD BE BROUGHT INTO NOR OUT OF THE EXAMINATION ROOM
	:	BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR

QUESTION 1

1. (a) Use the limit definition of the derivative to find $f'(x)$ given that $f(x) = 1 + x^2$ [7 marks]

(b) Evaluate the following limits

i. $\lim_{x \rightarrow 2} \frac{x^2 - x + 2}{x^2 + x - 6}$ [6 marks]

ii. $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$ [6 marks]

iii. $\lim_{x \rightarrow 0} \frac{\sqrt{x+4} - 2}{x}$ [6 marks]

QUESTION 2

2. (a) Find the derivatives of the following functions

i. $y = x^2 e^{x^2}$ [6 marks]

ii. $y = \frac{x^2 - 1}{x^2 + 1}$ [6 marks]

iii. $y = (x^2 + x + 1)^3$ [6 marks]

(b) Find the second derivative, y'' , given that $y = (2x + 1)^8$ [7 marks]

QUESTION 3

3. (a) For the function $y = x^3 - 27x + 9$ find

i. the intervals in which the graph is increasing/decreasing [3 marks]

ii. stationary points and classify them [3 marks]

iii. the intervals in which the graph is concave up/down [3 marks]

iv. inflexion points [3 marks]

(b) A farmer has 600m of fencing available. He intends to use it to fence off three sides of a rectangular field in which the fourth side is bounded by a stream and is not to be fenced. Find the field of maximum area that can be fenced with the fencing available. [13 marks]

]

QUESTION 4

4. Evaluate the following integrals

(a) $\int (1 + x + x^2 + \frac{1}{x}) dx$ [7 marks]

(b) $\int 2x\sqrt{x^2 + 1} dx$ [6 marks]

(c) $\int xe^{2x} dx$ [6 marks]

(d) $\int \frac{5x + 1}{(x - 1)(x + 2)} dx$ [6 marks]

QUESTION 5

5. (a) Evaluate the following definite integrals

i. $\int_{-1}^1 (2 - 3x + 2x^2) dx$ [7 marks]

ii. $\int_1^4 2\sqrt{x} dx$ [8 marks]

(b) Find the area enclosed by the curve $y = 1 - x^2$ and the x -axis. [10 marks]

QUESTION 6

6. (a) Evaluate the following integrals

i. $\int \frac{9x^2}{(x^3 + 1)^4} dx$ [8 marks]

ii. $\int 2x(x^2 + 1)^3 dx$ [7 marks]

(b) The population of a certain city is increasing at the rate given by

$$P'(t) = 2000e^{0.04t}$$

where t is the time in years from the beginning of 1992. Find the change in population from the beginning of 1994 to the beginning of 1997. [10 marks]

END OF EXAMINATION
