

KABARAK



UNIVERSITY

UNIVERSITY EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE CERTIFICATE OF PRE-UNIVERSITY MATHEMATICS

COURSE CODE: PMATH 022

COURSE TITLE: BASIC CALCULUS

STREAM: PRE – UNIVERSITY SEM TWO

DAY: TUESDAY

TIME: 2.00 – 4.00 P.M.

DATE: 04/08/2008

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

1. (a) What do you understand by the following terminologies

(i) a function

(ii) a primitive function

(iii) critical number

(6 mks)

(b) Differentiate the following function by use of first principle technique.

(i) $y = 2x^2 + x + 7$

(3 mks)

(ii) $y = \frac{1}{x^2}$

(3 mks)

(c) Given that a real valued function is defined by $f(t) = 2t(4t - 1) + 3$

(i) $f(2)$

(1 mk)

(ii) $fff(1)$

(2 mks)

(iii) $f(x + 2)$

(2 mks)

(d) Given $f(x) = 2x^3 - x + 1, g(x) = 2x - 1$

$h(x) = 10$. Find

(i) $f(x) \ g(x)$

(2 mks)

(ii) $\frac{f(x)}{g(x)}$

(2 mks)

(iii) fog

(2 mks)

(iv) $fogoh$

(2 mks)

(e) Evaluate

$$\lim_{x \rightarrow 4} \frac{2x^2 + 8x + 8}{x^2 - 64}$$

(2 mks)

(f) Verify $\lim_{x \rightarrow 4} x^2 + 2x + 4 = 12$

(3 mks)

QUESTION TWO (20 MARKS)

(a) Differentiate and find gradient at a specified point

(i) $f(x) = \frac{x^3}{3} + \frac{1}{x^2} + 4x + 3$ at (2, 3) **(3 mks)**

(ii) $f(x) = \sqrt{x^2 + 6x + 8}$ at (1, 9) **(3 mks)**

(iii) $f(x) = (x^2 + 2x + 6)^{10}(x + 4)^4$ at (0, 11) **(4 mks)**

(iv) $f(x) = \frac{(x^2 + 2x + 4)}{(x + 2)^2}$ at (1, 3) **(4 mks)**

(b) Investigate the local extrema of the following function.

$f(x) = x^4 - 8x^2 + 10$ **(6 mks)**

QUESTION THREE (20 MARKS)

(a) Define a limit **(3 mks)**

(b) With a good illustration show the relationship between ϵ and δ . **(3 mks)**

(c) State the conditions necessary for a function to be continuous. **(3 mks)**

(d) Evaluate (i) $\lim_{x \rightarrow 0} \frac{x^2 + x}{x}$ **(2 mks)**

(ii) $\lim_{x \rightarrow 0} \frac{x}{x^2}$ **(2 mks)**

(iii) $\lim_{x \rightarrow 3} \frac{\sqrt{x+3}}{3}$ **(2 mks)**

(iv) $\lim_{x \rightarrow 3} \frac{x^2 + 2x - 15}{x^2 - 9}$ **(2 mks)**

(e) Show that

$$\lim_{x \rightarrow 2} 4x + 10 = 18$$

(3 mks)

QUESTION FOUR (10 MKS)

(a) Investigate the term local extrema.

(i) $f(x) = 3x^5 - 5x^3$ **(4 mks)**

(ii) $f(x) = x^2 + 4x + 3$ **(4 mks)**

(b) Given a function $xy^2 + 2x + y^2 = 0$

Find y^1 and y^{11} hence find the tangent and normal equations at appoint $(1,-1)$ **(8 mks)**

(c) Evaluate $\int_1^2 (x^2 + x + 4)dx$ **(4 mks)**

QUESTION FIVE (10 MKS)

(a) Find the velocity and acceleration at the time $t = 2$ sec for particle moving in a straight line if its motion obeys the law $S = t^3 + 5t^2 + 4$ **(5 mks)**

(b) Evaluate $\int_{-2}^2 (x^2 - 4)dx$ **(5 mks)**

(c) A ball was thrown upwards with a velocity 40m/s.

(i) State the acceleration, velocity and distance statements. **(5 mks)**

(ii) Find the maximum height the ball can attain. **(5 mks)**