

KABARAK



UNIVERSITY

UNIVERSITY EXAMINATIONS

2009/2010 ACADEMIC YEAR

FOR THE CERTIFICATE OF BRIDGING MATHEMATICS

COURSE CODE: BMATH 003

COURSE TITLE: BASIC CALCULUS

STREAM: BRIDGING MATHEMATICS

DAY: THURSDAY

TIME: 9.00 – 11.00 A.M.

DATE: 29/07/2010

INSTRUCTIONS:

- Answer Question **ONE** and Any Other **TWO** Questions

PLEASE TURN OVER

QUESTION ONE [30 MARKS]

a) Define the following terms:

- i. Calculus
- ii. Function
- iii. Domain

[3 marks]

b) Given that $f(x) = 5x^3 - 13x^2 + m$ and $f(1) = 0$, find the value of m hence find $f(5)$

[3marks]

c) Given that $f(x) = x^2$ $g(x) = (x-3)^{1/2}$ find, stating the domain of each of the following:

- i. $f + g$
- ii. $3f - g$
- iii. f/g
- iv. $g-g$

[8marks]

d) Evaluate the following:

- i. $\lim_{x \rightarrow 0} \left[\frac{(x^5 + 2x - 5)}{(2x - x^2)} \right]$
- ii. $\lim_{x \rightarrow 0} \left(\frac{1}{x^2} \right)$
- iii. $\lim_{x \rightarrow 0} (x^{1/2})$

[3marks]

[4marks]

[5marks]

e) Differentiate from 1st principle

$$y = x^2 + 5x$$

[4marks]

QUESTION TWO [20 MARKS]

a) Define the point of inflection as used in calculus

[1mark]

b) Find the equation of the normal and tangent of the curve $y = x^3 + 6x^2 - 3x + 1$ at the indicated point $x = 2$

[4marks]

c) Find $\frac{dy}{dx}$ given $y = (x^2 + x + 4)(x^3 + 4x^2 + 5x + 1)$

[3marks]

d) Determine the value of dy/dx $(3x-1)^{2/3}$ chain rule

[4marks]

e) Find the stationary point of the function $y = x^3 - 3x^2 - 9x$ and investigate their nature

[8marks]

QUESTION THREE [20 MARKS]

a) Given that the acceleration of a particle at any given time t , is described by the equation $a = 2t + 3t^2$, find the equation of its velocity at any time t if it is known that velocity is 20m/s when $t = 1$ sec. Further find the equation for the distance given that the particle is known to have covered 54m when $t = 23$ sec

[10marks]

b) Define the term differentiation as used in calculus

[1mark]

c) Use the mid-ordinate rule with 5 stripes to estimate the area under the curve $y = x^3$ on the x axis from $x = 0$ upto $x = 10$. Use the method of integration to establish the exact area under the curve and find its

percentage error in the estimate when the mid ordinate rule is used [9marks]

QUESTION FOUR [20 MARKS]

a) Differentiate from 1st principle $y=5$ [2marks]

b) Differentiate the following :

$$y = (5x+4)/(7x-6)$$

$$y = (x+1)/(x-2) \quad [6marks]$$

c) Find $\frac{dy}{dx}$ for $(x^2+y^2)^2$ [3marks]

d) Find the slope of the tangent to the curve at $x^2 + x/y + y^2$ at the point (1, 2) [3marks]

e) A particle moves in a straight line so that t sec after passing a fixed point in the line , its velocity ,V m/s is given by $v = \frac{1}{2} t^3 - 3t + 7$. Find :

i. V after 8sec.

ii. a when t=0

iii. Minimum velocity [6marks]

QUESTION FIVE [20MARKS]

a) Draw the graph of $y = \frac{1}{2}x^2 - 2$ for the values of x $-4 \leq x \leq 4$. Estimate the area enclosed by the curve at $x = -2$ and $x = 4$ and the x axis using 6 stripes by ordinate rule [9marks]

b) Evaluate the following:

$$\int_1^5 (x^2 - 6x + 5) \quad [3marks]$$

c) A body in motion is known to be accelerating according to the equation $a = 4t^3 - 3t^2 - 6t$, where a is the acceleration at any time t. Find the equation governing this body's velocity given that the velocity is known to be 12m/s when t=2sec. Establish the equation governing the body's distance at any time t given that s=2m when t=0 [8marks]