

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:

1. Attempt question **ONE** and any other **TWO** questions.
2. Show your **workings** clearly.

PLEASE TURN OVER

QUESTION ONE (30marks)

Answer all questions

a) What do you understand by the following terminologies;

i) a normal and tangent equations

ii) a function

iii) local extrema

(6mks)

b) $f(x) = 2x^2+x+1$ and $g(x)=3x+2$, find

i) $f(x)+g(x)$

(2marks)

ii) $g \circ f$

(2marks)

iii) $f(x) \cdot g(x)$

(2marks)

iv) $f(x)/g(x)$

(2marks)

c) Using the first principle method, differentiate

i. $y=x^2+3x-5$

(3marks)

ii. $f(x)=\sqrt{x+2}$

(3marks)

d) Differentiate the following

i. $Y=x^2+2x^2-x+6$ at $x=1$

(1marks)

ii. $h(x)=(2x^3+3)^3(x^4+1)^2$ at $x=0$

(2marks)

iii. $y=\frac{x^2+1}{x^2-1}$ at $x=3$

(2marks)

iv. $y=(x^2+1)^6$ at $x=2$

(2marks)

e) Evaluate the limits

i. $\lim_{x \rightarrow 2} \frac{x^2 - 25}{x - 5}$

(2marks)

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

(2marks)

QUESTION TWO

a) Given $f(x) = 2x^2+1$ and $g(x) = x+1$, find;

- i. $f \circ g$ (2marks)
- ii. $f(2)$ (2marks)
- iii. $ff(2)$ (2marks)
- iv. $g \circ f$ (2marks)
- v. What is the relationship between (i) and (iv) evaluated above? (1mark)

b) Verify the following limit

$$\lim_{x \rightarrow 1} 5x-3=2 \quad (3\text{marks})$$

c) Differentiate;

- i. $y=(x^2+2x+10)^{10}$ (2marks)
- ii. $y=(3x^2+10)^3(2x+4)$ (3marks)

d) Find the area bounded by the curve $y=3x^2+14x+15$, the x-axis and the ordinates at $x=-1$ and $x=2$ (3marks)

QUESTION THREE

a) Integrate the following

- i. $\int x^6 dx$ (2marks)
- ii. $\int (5x+4)dx$ (2marks)
- iii. $\int 2 dx$ (2marks)
- iv. $\int \frac{6}{x^2} dx$ (2marks)

b) Investigate the local extrema to the function

$$y=x^3-6x^2+9x+2 \quad (5\text{marks})$$

c) Find the equation of the tangent and normal to the curve

$$y=x^3-2x^2+3x-1 \text{ at the point } (2, 5) \quad (4\text{marks})$$

d) A rectangular storage container with an open top has a volume of 10m^3 and the rectangular base is twice its width. Material of the base cost is 10ksh per sq.metres and the material of the side cost 6 ksh per metre.

Express the cost of the material as a function of the width of the base (3marks)

QUESTION FOUR

a) Find the following integrals:

i) $\int (2x^2 + 2x - 1) dx$ (2mks)

ii) $\int_0^4 (2x + 1) dx$ (2 marks)

b) Find the derivatives of the following functions using the first principal technique.

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

ii) $y = 5x + 3$ (8 marks)

c) Find the tangent and normal equation to the curve $x^2 - y^2 = 7$ (4marks)
at a point (4,3)

d) Find the area enclosed by $y = 5 + 4x - x^2$, the x-axis and the ordinates 1 and $x = 4$ (4marks)

QUESTION FIVE

a) The total area of the surface of a solid cylinder is 132cm^2 . if the height of the cylinder is h cm and its radius is r cm, show that $h = 21 - r$. Hence find the volume of the cylinder. (5marks)

b) A curve passes through (2, 3) and its gradient function is $3x - 2$. find its equation (2marks)

c) State the ϵ - δ definition of a limit L of a function $f(x)$ as x tends to a point $x = a$ and use it to prove that $\lim_{x \rightarrow 2} (3x + 1) = 7$ (5marks)

d) A ball was thrown upwards with a velocity of 40m/s . find

i) Acceleration and velocity statements

ii) Maximum it can attain

(6marks)