KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2009/2010 ACADEMIC YEAR

FOR THE CERTIFICATE OF PRE-UNIVERSITY MATHEMATICS

COURSE CODE: PMATH 022

COURSE TITLE: BASIC CALCULUS

STREAM: SEMESTER TWO

DAY: MONDAY

TIME: 2.00 – 4.00 P.M.

DATE: 02/08/2010

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) gogof (2marks)

iii) $f(x).g(x)$ (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. $\lim_{x\to 2}\frac{x^2-25}{x-5}$ (2marks)

ii. $\lim_{x\to 1}\frac{x^2+x}{x^2-1}$ (2marks)

QUESTION TWO

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 = 2 - 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-d definition of a limit L of a function f(x) as x tends to a point x=a and use it to prove that $\lim_{x\to 2}$ (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)

QUESTION THREE

a) Integrate the following

i. $\int x^6\, dx$ (2marks)

ii. $\int (5\, x+4) dx$ (2marks)

iii. $\int 2\, dx$ (2marks)

iv. $\int \frac{6}{x^2}\, dx$ (2marks)

b) Investigate the local extrema to the function

$y=x^3-6x^2+9x+2$ (5marks)

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

$y=x^3-2x^2+3x-1$ at the point (2, 5) (4marks)

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)

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

i. fog (2marks)

ii. f(2) (2marks)

iii. ff(2) (2marks)

iv. gof (2marks)

v. What is the relationship between (i) and (iv) evaluated above? (1mark)

b) Verify the following limit

$\text{Lim}_{x \to 1}$ 5x-3=2 (3marks)

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)