KABARAK **UNIVERSITY**

UNIVERSITY EXAMINATIONS

2009/20010 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: **MATH 113**

COURSE TITLE: **CALCULUS I**

STREAM: **SESSION I**

DAY: **TUESDAY**

TIME: **2.00 – 4.00 P.M.**

DATE: **10/08/2010**

INSTRUCTIONS:
  ➢ Attempt question **ONE** and any other **TWO** Questions

PLEASE TURNOVER

QUESTION ONE   (30MKS)

(a)   Given $y = uv$ deduce the product Rule.   **(3mks)**

(b)   (i)   Find $\displaystyle Lim_{x \to \infty} \frac{2x^2 - 2}{3x^2 - 3x + 2}$ **(3mks)**

      (ii)   Find $\displaystyle Lim_{x \to 0} \frac{\sin x - \cos 3x}{x^2}$ **(3mks)**

(c)   Use first principles to find the derivative of
      (i) $f(x) = 6x$ **(3mks)**
      (ii) $f(x) = e^x$ **(3mks)**

(d) Show that $\displaystyle Lim_{x \to a} x^2 = a^2$ **(3mks)**

(e)   Find the equation of the line which passes through the point (5, 3) and is parallel
      to the tangent to the curve, $y = x^2$ at the point (3, 9)   **(3mks)**

(f)   Differentiate the following functions:
      (i) $y = (x^2 - 5)(x - x^3)$ at $x = 1$ **(3mks)**
      (ii) $y = \dfrac{3x^2 - 5}{1 - x^3}$ **(3mks)**

QUESTION TWO   (20MKS)

(a)   Use the first principles to find the derivative of:

      $y = \cos x.$ **(8mks)**

(b)   For the function defined by $y = 2x^3 - 15x^2 + 24x + 19$, find the stationary points and
      distinguish between them.   **(6mks)**

(c)   If $x = t^3 + t^2$ and $y = t^2 + t$ find $\dfrac{dy}{dx}$ at $t = 1$ **(6mks)**

QUESTION THREE   (20MKS)

(a)   A particle moves along a straight line in such a way that its distance from a fixed point o on the line after t seconds is S meters, where $S = \frac{1}{6}t^4$. Find;

    (i)   Its velocity after 3 seconds and after 4 seconds   **(3mks)**

    (ii)   Its acceleration after 2 seconds and after 4 seconds   **(3mks)**

(b)   Find the equation of the normal to the curve $y = x^2 + 3x$ at the point where $x = 1$ **(6mks)**

(c)   Find $\frac{dy}{dx}$, given that $f(x) = xy + 2x + 3$ **(5mks)**

(d)   Evaluate $\underset{x\to\infty}{Lim}\left(1 + \frac{4}{x}\right)^{2+x}$ **(3mks)**

QUESTION FOUR   (20MKS)

(a)   Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ if $x^2y + 2y^3 + 4x = 0$ at a point (1, 1)   **(15mks)**

(b)   A 2% error is made in measuring the radius of a sphere. Find the percentage error in surface area.   **(5mks)**

QUESTION FIVE   (20MKS)

(a)   Differentiate the following:

    (i) $y = \ln^2\left(x^2 + 2x + 1\right)^2$ **(3mks)**

    (ii) $y = Sin^3 2x$ **(3mks)**

(b)   Find $\frac{dy}{dx}$ when $x = 1$ of $y = \frac{u}{u+1}$ and $u = 3x^2 - 1$ **(8mks)**

(c)   Find the equation of the curve given the gradient is $4x - 2$ and the curve passes through point (1, 2)   **(4mks)**

(d)   Evaluate $\underset{x\to 0}{Lim}\ \frac{x^2 + x}{x}$ **(2mks)**