KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

MAIN CAMPUS

SECOND SEMESTER 2019/2020 ACADEMIC YEAR

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

MATH 113: CALCULUS 1

STREAM: Y1S1 **TIME:9.00-11.00 PM**

EXAMINATION SESSION: APRIL 2019 **DATE: 9/04/2019**

INSTRUCTION:

 Answer question **ONE** and any other **TWO**

QUESTION ONE (30MARKS)

a) Find the extrema of the function f(x)

$f(x) = 3x^4 - 4x^3$ on [-1,2] **(5 Marks)**

b) Evaluate f'(x) from the first principles given

$f(x) = \cos x$ **(6 marks)**

c) Evaluate the given limit

$$\lim_{t \to 0} \frac{\sqrt{t^2 + 100} - 10}{t^2}$$

(5 Marks)

d. Use the second derivative` to determine whether the function y= xy-x^2-y^2-2y+4 has a minimum or a maximum. **(4Mks)**

e. (i) Differentiate implicitly f(x) = ln (x^{-4} + x^4). **(3Mks)**

(ii) The curve y= x^2+ax+b has a turning point at (1,3). Find the value of a and b. **(3Mks)**

f. Find the equation of the tangent to the circle x^2+4y^2 =80 at the point (1,1). **(4Mks)**

QUESTION TWO (20MARKS)

(a) Find the value of $f^{-1}(x)$from the definition at (1,1) given

$$f(x) = \sqrt{x}$$ **(7 Marks)**

(b) Prove that

$$y'' = e^x \cos x \quad \text{given} \quad y = e^x \sin x$$ **(7 Marks)**

(c) Evaluate

$$\frac{d}{dx}(\tan x)$$ **(6 Marks)**

QUESTION THREE (20 MARKS)

a. (i) Differentiate y= cos ($2x^2$+3) **(3Mks)**

(ii) Find y' if y= x^{-2}(4+3x^{-3}) **(3Mks)**

b. (i) Find the extreme value of the function y= x^2+xy+y^2+3x-3xy. **(3Mks)**

(ii) Find the equation of the tangent line to the circle x^2+y^2=36 at a point (3,4). **(4Mks)**

c. Find points on the intersection of the planes x + y + z = 1 and 3x + 2y + z = 6 that are closest to the origin. **(7Mks)**

QUESTION FOUR (20MARKS)

a) Find the equation of the tangent of the curve given as

$$x^3 + y^3 - 9xy = 0 \quad \text{at} \quad (2,4)$$ **(10 Marks)**

b) Compute the derivative of the given function

$$y = \left(\frac{3x^2 - 1}{x^2 + x}\right)^3$$

(7 Marks)

c) Solve

$$\frac{d}{dx}(xe^x)$$

(3 Marks)

QUESTION FIVE **(20Marks)**

(a) Evaluate the given limit

$$\lim_{x \to 1} \frac{x^3 - 1}{x - 1}$$

(5 Marks)

(b) FA ball is thrown up from the top of a cliff with an initial velocity of 96m/s and moves according to the following equation

$$s = 110 + 96 - 16t^2$$

Determine the velocity of the ball after t seconds

(i) Find the time in which the ball is at rest, hence determine the distance travelled by the ball

(ii) Calculate the acceleration of the ball after 10 seconds **(8 Marks)**

d) Evaluate f'(x) from the definition given

$$f(x) = \sin x$$

(7 Marks)