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)

$$f(x) = 3x^4 - 4x^3 \text{ on } [-1,2]$$ **(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)**

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(1 Peter 3:15)

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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

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

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