**MAT110: Differential Calculus
and Co-ordinate Geometry
BRAC University**

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SET: D

Assignment 3

*Please write your name and ID on the assignment script. The deadline for submitting the assignment is **8th August 2020**. Solve **all the problems**. You will receive 5 bonus marks for **submitting your assignment in Latex**.*

Any information you need to solve this exam are given in the question.

*Watch the videos in this Playlist if you are confused about the assignment process: **All About Assignments Playlist, Click Here***

*Be creative, use your intuition. Answer the questions by yourself. Cheating and Copying will lead to **50%** deduction from your total marks in the course and a Zero in the assignment. **Total marks is 60**. Each question carries 10 marks.*

1. A rectangular field is to be bounded by a fence on three sides and by a straight stream on the fourth side. Find the dimensions of the field with maximum area that can be enclosed using 1000 ft of fence.

2. Find the equation of the tangent line of the equation $x^2 + 3xy + y^3 = 15$ at the point $(1, 2)$

3. Find the relative extrema of the function $f(x) = x^4 - 12x^3$.

4. For each of the following, use logarithmic differentiation to find $\dfrac{dy}{dx}$:

   (a) $y = (\sin x)^{\sin x}$

   (b) $y = \sqrt{e^x \sin x}$

   (c) $y = \sqrt{(x-1)^2 e^{-x} \cos x}$

5. Let, $f(x) = \sin x - \cos x$. Find:

   (a) the intervals on which f is increasing

   (b) the intervals on which f is decreasing

   (c) the intervals on which f is concave up

   (d) the open intervals on which f is concave down

   (e) the x-coordinates of all inflection points.

6. Find n^{th} derivative of the function $y = e^x x^2$.