BRAC UNIVERSITY

Inspiring Excellence

Department of Mathematics and Natural Sciences

MAT 110

ASSIGNMENT 2

SUMMER 2021

SET: 5 (MJM)

Please write your name and ID on the first page of the assignment answer script - you have to do this for both handwritten or LaTeX submission. The last date of submission is 17-7-2021, 1159 pm. Solve all problems.

You can only submit a PDF file - image or doc files won't be accepted. Before submitting the PDF, please rename the PDF file in the format - SET_ID_SECTION.

Answer the questions by yourself. Plagiarism will lead to an F grade in the course. ***Total marks is 300. Each question is worth 50 marks.****If you do your work using LaTeX you will get a mark which will be added as a LaTeXbonus to your course grade.*

If you use LaTeX, you must add a screenshot of the raw code and compiled pdf side by side, in order to earn your bonus.

This set was prepared by MJM. If you have any questions, please text MJM on Slack.

1. Find an expression for the derivative $\frac{dy}{dx}$ of the parametric function: $x = te^{2t} + \ln(t^2)$ and $y = t^2e^t$ and evaluate it at $t = 1$. Express your answer in terms of e.

2. Use logarithmic differentiation to find an expression for the derivative $\frac{dy}{dx}$ of

$$y = \frac{e^{-x}(\cos x)^2}{x^2 + x + 1}$$

3. Using Leibniz product rule, find an expression for the 5th derivative of the function
$$y = (x^2 + 3x)\cosh(x)$$
and evaluate it at $x = 0$.

4. Find an expression for the first derivative of the function
$$y = \sqrt{e^{\arcsin(x+1)}}$$

5. Let $f(x) = x^2 + 3$. Find an expression for the linear approximation for $f(x)$ at $x_0 = 2$ and use it to find an approximation when $x = 2.2$.

6. A cuboid with an open top was made using a metal sheet. The volume of the cuboid is $4000cm^3$. The base of the cuboid measures x cm by $2x$ cm and it has a height of h cm.
Using the expressions for the volume and surface area of the cuboid, find its minimum possible surface area. Show that the value you obtained is in fact a minimum value.