BRAC UNIVERSITY

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Department of Mathematics and Natural Sciences

MAT 110

Open Book Assignment

SUMMER 2021

SET: 2 (SKN)

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 23/8/2021, 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.

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 SKN. If you have any questions, please text SKN on Slack.

1. Determine the 1st - and 2nd -degree Taylor polynomial approximations, $L(x, y)$ and $Q(x, y)$, for the following function of x and y near the given point: $f(x, y) = x \exp(y) + 1$ near the point $(1, 0)$.

2. A rectangular box without a lid is to be made from $12m^2$ of cardboard. Find the maximum volume of such a box.

3. Find the local maximum and minimum values and saddle points of $f(x, y) = x^4 + y^4 - 4xy + 1$.

4. Find the directional derivative of the function $f(x, y) = x^2y^3 - 4y$ at the point $(2, -1)$ in the direction of the vector $\vec{v} = 2\hat{i} - 5\hat{j}$.

5. If $f(x, y, z) = x^2y + y^2z$, (a) find the gradient of f and (b) find the directional derivative of f at $(1, 2, 3)$, in the direction of $\vec{v} = 2\hat{i} - \hat{j} + 2\hat{k}$.

6. Compute $div\vec{F}$ and $curl\vec{F}$ for $\vec{F} = (3x + 2z^2)\hat{i} + \dfrac{x^3y^2}{z}\hat{j} - (z - 7x)\hat{k}$.