BRAC UNIVERSITY

Inspiring Excellence

Department of Mathematics and Natural Sciences

MAT 110

ASSIGNMENT 4

SUMMER 2021

SET: 11 (FAB)

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 25/8/2021, 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.

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

1. Determine the 1st and 2nd degree Taylor polynomials L(x,y) and Q(x,y) for $f(x, y) = xe^y + 1$ for (x, y) near the point (1,0).

2. Locate all relative maxima, relative minima and saddle points (if any) for $f(x, y) = 4xy - x^4 - y^4$.

3. Determine the 1st and 2nd degree Taylor polynomials $L(x, y)$ and $Q(x, y)$ for $f(x, y) = xe^y + 1$ for (x, y) near the point $(1, 0)$.

4. With the help of vector operation, find the area of the triangle that is determined by the points, $(1, 2, -1)$, $(-1, 0, 2)$, $(4, -1, 3)$.

5. Let $\mathbf{F}(x, y, z) = x^2y\mathbf{i} + 2y^3z\mathbf{j} + 3z\mathbf{k}$, find divergence and curl of vector field $\mathbf{F}$.

6. The volume V of the parallelopiped that has $\mathbf{u}$, $\mathbf{v}$, $\mathbf{w}$ as adjacent edges is given by: $V = |\mathbf{u}.(\mathbf{v} \times \mathbf{w})|$. If $\mathbf{u}.(\mathbf{v} \times \mathbf{w}) = \mathbf{0}$, then $\mathbf{u}$, $\mathbf{v}$, $\mathbf{w}$ lie in the same plane. Thus, find the volume of the parallelopiped formed by the followings: $\mathbf{u} =< 1, 2, 3 >, \mathbf{v} =< 4, 5, 6 >,\ \mathbf{w} =< 2, -3, 4 >$