



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 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 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: $V = |\mathbf{u} \cdot (\mathbf{v} \times \mathbf{w})|$. If $\mathbf{u} \cdot (\mathbf{v} \times \mathbf{w}) = 0$, then \mathbf{u} , \mathbf{v} , \mathbf{w} lie in the same plane. Thus, find the volume of the parallelopiped formed by the followings:
 $\mathbf{u} = \langle 1, 2, 3 \rangle$, $\mathbf{v} = \langle 4, 5, 6 \rangle$, $\mathbf{w} = \langle 2, -3, 4 \rangle$
7. Determine the 1st and 2nd degree Taylor polynomials $L(x, y)$ and $Q(x, y)$ for $f(x, y) = x^2y + y^2$ for (x, y) near the point $(1, 3)$.
8. Determine the 1st and 2nd degree Taylor polynomials $L(x, y)$ and $Q(x, y)$ for $f(x, y) = \ln(x^2 + y^2 + 1)$ for (x, y) near the point $(0, 0)$.
9. Locate all relative maxima, relative minima and saddle points (if any) for
 $f(x, y) = x^2 + y^2 + \frac{2}{xy}$
10. Locate all relative maxima, relative minima and saddle points (if any) for
 $f(x, y) = xy + \frac{2}{x} + \frac{4}{y}$.
11. Compute the Divergence and Curl of the following vector \vec{F}
 $\vec{F} = yze^{xy}\vec{i} + xze^{xy}\vec{j} + (e^{xy} + 3\cos 3z)\vec{k}$
12. Compute the Divergence and Curl of the following vector
 $\vec{F} = (xyz)\vec{i} + y\sin z\vec{j} + (y\cos x)\vec{k}$