NAME: (print!) __Krithika Patrachari__   Section: __22__

E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attach-ment: qXFirstLast.pdf) ASAP BUT NO LATER THAN Oct. 1, 2020, 8:00pm

1. Find the directional derivative of the function $f(x, y, z) = xy^2z^3$ at the point $(2, 1, 1)$ in the direction $\langle 2, -1, -1 \rangle$.

$$\nabla f = \langle y^2z^3, xz^3, xy^2 \rangle$$

$$|\langle 2, -1, -1 \rangle| = \sqrt{2^2 + (-1)^2 + (-1)^2} = \sqrt{4 + 1 + 1} = \sqrt{6}$$

$$u = \left\langle \frac{2}{\sqrt{6}}, \frac{-1}{\sqrt{6}}, \frac{-1}{\sqrt{6}} \right\rangle$$

$$\nabla f(2, 1, 1) = \langle 1, 2, 2 \rangle$$

$$\nabla f \cdot u = \frac{2}{\sqrt{6}} - \frac{2}{\sqrt{6}} - \frac{2}{\sqrt{6}} = \boxed{\frac{-4}{\sqrt{6}}}$$

2. Find the maximum rate of change of $f(x, y) = x^2 + y^3$ at the point $(2, 1)$ and the direction in which is occurs.

$$\Delta f = \langle 2x, 3y^2 \rangle$$

$$\Delta f(2, 1) = \langle 2(2), 3(1)^2 \rangle = \langle 4, 3 \rangle$$

$$|\langle 4, 3 \rangle| = \sqrt{16 + 9} = \sqrt{25} = \boxed{5}$$