NAME: (print!) _Daniel Gameiro_   Section: _23_

E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: 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 $\langle 2, -1, -1 \rangle$.

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

$$\nabla f \text{ at } (2,1,1) = \langle 1, 4, 6 \rangle$$

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

$$\langle \frac{2}{\sqrt{6}}, -\frac{1}{\sqrt{6}}, -\frac{1}{\sqrt{6}} \rangle \cdot \langle 1, 4, 6 \rangle = -\frac{8}{\sqrt{6}}$$

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.

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

$$\nabla f \text{ at } (2,1) = \langle 4, 3 \rangle$$

$$|\nabla f| = 5$$

Maximum rate of change is 5 in the direction $\langle \frac{4}{5}, \frac{3}{5} \rangle$