NAME: (print!) Matthew Czernesky **Section:** _____

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 $\langle 2, -1, -1 \rangle$.

$\dfrac{\partial f}{\partial x} = y^2 z^3$

$\dfrac{\partial f}{\partial y} = 2xyz^3$

$\dfrac{\partial f}{\partial z} = 3xy^2z^2$

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

$\nabla f = \langle 1, 4, 6 \rangle$

$\langle 1, 4, 6 \rangle \cdot \langle 2, -1, -1 \rangle$

$= 2 + (-4) + -6$

$\boxed{= -8}$

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.

$\dfrac{\partial f}{\partial x} = 2x$

$\dfrac{\partial f}{\partial y} = 3y^2$

$\| \nabla f \| = \sqrt{4^2 + 3^2} \boxed{= 5}$

in direction $\boxed{\langle \frac{4}{5}, \frac{3}{5} \rangle}$

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

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