

9/28/20 Quiz for Lecture 8.

1)  $f(x, y, z) = xy^2z^3$  at  $(2, 1, 1)$   
in the direction  $\langle 2, -1, -1 \rangle$

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

$$\nabla f_{(2,1,1)} = \langle 1, 4, 6 \rangle$$

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

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

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

2)  $f(x, y) = x^2 + y^3$  at  $(2, 1)$  in the  
direction it occurs.

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

$$\nabla f_{(2,1)} = \langle 4, 3 \rangle$$

$$\| \langle 4, 3 \rangle \| = 5$$

$$\langle \frac{4}{5}, \frac{3}{5} \rangle \rightarrow \text{Unit Vector direction}$$

- Max Rate of Change is 5 in the direction

$$\langle \frac{4}{5}, \frac{3}{5} \rangle$$