

"QUIZ" for Lecture 8

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

$$V = \sqrt{2^2 + (-1)^2 + (-1)^2} = \sqrt{6} = \frac{2}{\sqrt{6}}, \frac{-1}{\sqrt{6}}, \frac{-1}{\sqrt{6}}$$

$$\begin{array}{l} x(y^2z^3) \quad | \quad y^2(xz^3) \\ x \cdot 0 + 1(y^2z^3) \quad | \quad y^2 \cdot 0 + 2yz^3 \end{array} \left. \begin{array}{l} z^3(xy^2) \\ z^3 \cdot 0 + 3z^2xy^2 \end{array} \right\}$$

$$\nabla f = y^2z^3, 2yz^3, 3z^2xy^2$$

$$\nabla f = 1, 4, 6 \quad \nabla f \cdot V = \frac{2}{\sqrt{6}} + \frac{-4}{\sqrt{6}} + \frac{-6}{\sqrt{6}} = \frac{-8}{\sqrt{6}}$$

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 it occurs.

$$f_x = 2x \quad f_y = 3y^2 \quad \nabla f = (2x, 3y^2) \quad (4, 3)$$

$$\sqrt{4^2 + 3^2} = \sqrt{16 + 9} = \sqrt{25} = \text{max rate}$$

$$\text{direction} = V = \frac{4}{5}, \frac{3}{5}$$