

"QUIZ" for Lecture 8

NAME: (print!) SAL EMBAR 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  $\langle 2, -1, -1 \rangle$ .

$$\begin{array}{l} f_x = y^2z^3 \\ f_y = 2xyz^3 \\ f_z = 3xy^2z^2 \end{array} \Bigg|_{(2, 1, 1)} = \begin{array}{l} f_x = 1 \\ f_y = 4 \\ f_z = 6 \end{array} \quad \Delta f = \langle 1, 4, 6 \rangle$$

$$u = \frac{\langle 2, -1, -1 \rangle}{\sqrt{6}} = \langle 0.82, -1.22, -1.22 \rangle$$

$$\begin{aligned} \Delta f \cdot u &= \langle 1, 4, 6 \rangle \cdot \langle 0.82, -1.22, -1.22 \rangle \\ &= 0.82 - 4.88 - 7.32 = \\ &= \boxed{-11.28} \end{aligned}$$

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.

$$\begin{array}{l} f_x = 2x + y^3 \\ f_y = x^2 + 3y^2 \end{array}$$

$$\Delta f(2, 1) = \langle 5, 7 \rangle$$

$$ROC = \sqrt{5^2 + 7^2} = \sqrt{25 + 49} = \sqrt{74}$$