

Name: Key

Calculus 251:C3 Quiz #7 - 6/4/2020 Topic: Sections 14.3-14.4

Instructions. Answer the questions in the spaces provided or on your own paper, then scan and upload to Canvas. Show and label all of your work. Responses with no work may receive no credit even if the answer is correct.

(1) Let $f(x, y, z) = x^3 y^2 z e^x + \cos(yz)$.

3 pts (a) Calculate f_x

$$\begin{aligned} f_x &= y^2 z (3x^2 e^x + x^3 e^x) + 0 \\ &= 3x^2 y^2 z e^x + x^3 y^2 z e^x \end{aligned}$$

3 pts (a) Calculate f_{yz}

$$\begin{aligned} f_y &= 2x^3 y z e^x - \sin(yz) \cdot (z) \\ f_{yz} &= 2x^3 y e^x - \sin(yz) - yz \cos(yz) \end{aligned}$$

4 pts (2) Find an equation of the plane tangent to the graph of $z = xy^3 - x^2 y$ at the point where $x = 1$ and $y = 2$.

$$\text{Let } f(x, y) = xy^3 - x^2 y. \quad f(1, 2) = 6$$

$$f_x = y^3 - 2xy \quad f_y = 3xy^2 - x^2$$

$$f_x(1, 2) = 4 \quad f_y(1, 2) = 11$$

So we know $P_0 = (1, 2, 6)$ is on plane P .

P has normal vector $\vec{n} = \langle f_x, f_y, -1 \rangle = \langle 4, 11, -1 \rangle$

Equation of P : $z = f(a, b) + f_x(a, b)(x - a) + f_y(a, b)(y - b)$

$$z = 6 + 4(x - 1) + 11(y - 2)$$