

Name: Key

Calculus 251:C3 Quiz #8 - 6/14/2021 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) For the function $f(x, y) = x^3 \cos(y) - \tan(x^2 + y)$, calculate each of the following partial derivatives:

2 pts (a) $f_x = 3x^2 \cos y - \sec^2(x^2 + y) (2x)$
 $= 3x^2 \cos y - 2x \sec^2(x^2 + y)$

2 pts (b) $f_y = -x^3 \sin y - \sec^2(x^2 + y)$

2 pts (c) $f_{xy} = \frac{\partial}{\partial y} (3x^2 \cos y - 2x \sec^2(x^2 + y))$
 $= -3x^2 \sin y - 2x (2 \sec(x^2 + y) (\tan(x^2 + y) \sec(x^2 + y)))$
 $= -3x^2 \sin y - 4x \sec^2(x^2 + y) \tan(x^2 + y)$

4 pts

(2) Calculate $\frac{\partial f}{\partial s}$ and $\frac{\partial f}{\partial t}$ using any appropriate method given:

$$f(x, y) = x^2 + y^2$$

$$x(s, t) = 3s - t^2$$

$$y(s, t) = s^2 - 2t$$

Your answers must be in terms of s and t only. (That is, neither x nor y should appear in your answer).

$$\frac{\partial f}{\partial s} = \frac{\partial f}{\partial x} \cdot \frac{\partial x}{\partial s} + \frac{\partial f}{\partial y} \cdot \frac{\partial y}{\partial s}$$

$$= (2x)(3) + (2y)(2s)$$

$$= (6s - 2t^2)(3) + (2s^2 - 4t)(2s)$$

$$= 18s - 6t^2 + 4s^3 - 8st$$

$$\frac{\partial f}{\partial t} = \frac{\partial f}{\partial x} \cdot \frac{\partial x}{\partial t} + \frac{\partial f}{\partial y} \cdot \frac{\partial y}{\partial t}$$

$$= (6s - 2t^2)(-2t) + (2s^2 - 4t)(-2)$$

$$= -12st + 4t^3 - 4s^2 + 8t$$