

QUIZ 15 SOLUTIONS: LESSON 19  
MARCH 4, 2019

Write legibly, clearly indicate the question you are answering, and put a box or circle around your final answer. If you do not clearly indicate the question numbers, I will take off points. Write as much work as you need to demonstrate to me that you understand the concepts involved. If you have any questions, raise your hand and I will come over to you.

1. [5 pts] Find  $f_x$  and  $f_y$  given

$$f(x, y) = \sqrt{1 - 7x^2 - 4y^3} = (1 - 7x^2 - 4y^3)^{1/2}$$

$$f_x = \frac{\partial}{\partial x} (1 - 7x^2 - 4y^3)^{1/2}$$

$$= \frac{\partial}{\partial x} (1 - 7x^2 - 4y^3) \left[ \frac{1}{2} (1 - 7x^2 - 4y^3)^{1/2 - 1} \right]$$

$$= (-14x) \left( \frac{1}{2} \right) (1 - 7x^2 - 4y^3)^{-1/2}$$

$$= \boxed{\frac{-7x}{\sqrt{1 - 7x^2 - 4y^3}}}$$

$$f_y = \frac{\partial}{\partial y} (1 - 7x^2 - 4y^3)^{1/2}$$

$$= \frac{\partial}{\partial y} (1 - 7x^2 - 4y^3) \left[ \frac{1}{2} (1 - 7x^2 - 4y^3)^{1/2 - 1} \right]$$

$$= (-12y^2) \left( \frac{1}{2} \right) (1 - 7x^2 - 4y^3)^{-1/2}$$

$$= \boxed{\frac{-6y^2}{\sqrt{1 - 7x^2 - 4y^3}}}$$

2. [5 pts] Let

$$f(x, y) = \frac{10x^2y^3}{y - 8x}$$

Evaluate  $f_x(x, y)$  at  $(1, -1)$ . Round your answer to 4 decimal places.

$$f_x = \frac{\partial}{\partial x} \left( \frac{10x^2y^3}{y - 8x} \right)$$

$$= 10y^3 \frac{\partial}{\partial x} \left( \frac{x^2}{y - 8x} \right)$$

$$= 10y^3 \left[ \frac{(y - 8x) \frac{\partial}{\partial x} (x^2) - x^2 \frac{\partial}{\partial x} (y - 8x)}{(y - 8x)^2} \right]$$

$$= 10y^3 \left[ \frac{(y - 8x)(2x) - x^2(-8)}{(y - 8x)^2} \right]$$

$$= 10y^3 \left[ \frac{2xy - 16x^2 + 8x^2}{(y - 8x)^2} \right]$$

$$= 10y^3 \left[ \frac{2xy - 8x^2}{(y - 8x)^2} \right]$$

$$f_x(1, -1) = 10(-1)^3 \left[ \frac{2(1)(-1) - 8(1)^2}{(-1 - 8(1))^2} \right]$$

$$= -10 \left[ \frac{-2 - 8}{(-9)^2} \right]$$

$$= -10 \left( \frac{-10}{81} \right)$$

$$= \frac{100}{81} \approx \boxed{1.2346}$$