

Name: \_\_\_\_\_

Math 2030, Fall 2017, Quiz 5  
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R. Bruner

No calculators needed or allowed.

Let

$$f(x, y) = x^2y + xy^3.$$

Points

- 4 1. Compute  $\partial f/\partial x$  and  $\partial f/\partial y$ .
- 5 2. Find the tangent plane to  $z = f(x, y)$  at  $(x, y) = (1, 2)$ .
- 4 3. Calculate the differential  $df$ . [At  $(x, y)$ , not just at  $(1, 2)$ .]
- 2 4. Use the tangent plane to estimate  $f(1.2, 2.1)$ .
- 2 5. Use  $df$  to estimate  $f(1.2, 2.1)$ .
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$$1. \quad f_x = 2xy + y^3$$
$$f_y = x^2 + 3xy^2$$

$$2. \quad z_0 = f(1, 2) = 2 + 8 = 10$$
$$f_x(1, 2) = 4 + 8 = 12$$
$$f_y(1, 2) = 1 + 12 = 13$$

$$\text{Plane: } z - 10 = 12(x - 1) + 13(y - 2)$$

$$3. \quad df = (2xy + y^3)dx + (x^2 + 3xy^2)dy$$

$$4. \quad z - 10 = 12(1.2 - 1) + 13(2.1 - 2)$$
$$= 12(.2) + 13(.1)$$
$$= 2.4 + 1.3 = 3.7$$

so

$$z = 13.7$$

$$5. \quad df = 12dx + 13dy$$
$$= 12(.2) + 13(.1)$$
$$= 3.7$$

as in #4.

(using the values of  $f_x$  and  $f_y$  calculated in #2)

$$\text{Then } f(x+dx, y+dy)$$
$$\approx f(x, y) + df$$
$$= 10 + 3.7 = 13.7$$