Name:_____

Math 2030, Fall 2017, Quiz 6
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R. Bruner

No calculators needed or allowed.

Let

$$f(x,y) = 4y - x^2y - y^2.$$

1. Find the tangent plane to $z = f(x,y)$ at $(x,y) = (1,1)$.
2. Find the tangent plane to $z = f(x,y)$ at $(x,y) = (1,2)$.
3. Find the tangent line to the level curve $2 = f(x,y)$ at $(x,y) = (1,1)$.
4. Find the tangent line to the level curve $2 = f(x,y)$ at $(x,y) = (1,2)$.

$f_x = -2xy$
$f_y = 4 - x^2 - 2y$

(1.) At $(1,1)$ $f(1,1) = 4-1-1 = 2$
$f_x(1,1) = -2$
$f_y(1,1) = 4-1-2 = 1$

$$z - 2 = -2(x-1) + (y-1)$$

(2.) At $(1,2)$ $f(1,2) = 8-2-4 = 2$
$f_x(1,2) = -4$
$f_y(1,2) = 4-1-4 = -1$

$$z - 2 = -4(x-1) - (y-2)$$

(3.) Level curve at $(1,1)$ has tangent $\nabla f(1,1) \cdot (x-1, y-1) = 0$, i.e.

$$-2(x-1) + (y-1) = 0$$

(4.) At $(1,2)$

$$-4(x-1) - (y-2) = 0$$

OR

$$4(x-1) + (y-2) = 0$$