

## PARTIAL DERIVATIVES HANDOUT

MAY 6, 2019

**Exercise 1.** Let  $f(x, y) = x^3 + x^2y^3 - 2y^2$ .

(a) Compute  $f_x(1, 1)$  and  $f_y(1, 1)$ .

(b) Interpret the partial derivatives from the previous part as slopes.

(c) Compute  $f_{xx}(xy)$ ,  $f_{xy}(x, y)$ ,  $f_{yx}(x, y)$ , and  $f_{yy}(x, y)$ . What do you notice about  $f_{xy}(x, y)$  and  $f_{yx}(x, y)$ ?

(d) Find the equation of the plane  $z - f(1, 1) = f_x(1, 1)(x - 1) + f_y(1, 1)(y - 1)$ . We will see that this is the *tangent plane* to the graph of  $f$  at the point  $(1, 1, f(1, 1))$ .