Math 210 (Lesieutre)
Quiz 6
March 1, 2017

Name: ______________________________

Problem 1. *Use the method of Lagrange multipliers to find the maximum value of the function $f(x, y) = x$ subject to the constraint $x^2 + y^2 = 1$. (No credit if you do it without using Lagrange.)*

First let's come up with the equations. The functions are $f(x, y) = x$ and $g(x, y) = x^2+y^2-1$.

$$\nabla f(x, y) = \langle 1, 0 \rangle$$
$$\nabla g(x, y) = \langle 2x, 2y \rangle .$$

The equations are then $\langle 1, 0 \rangle = \lambda \langle 2x, 2y \rangle$, so

$$2x\lambda = 1,$$
$$2y\lambda = 0,$$
$$x^2 + y^2 = 1.$$

Notice that λ can't possibly be 0: then the first equation wouldn't have any solution. But then the second equation tells us that $y = 0$. The third then gives $x = \pm 1$, and so the two solutions are $(x, y) = (1, 0)$ and $(x, y) = (-1, 0)$.

What are the function values?

(x, y)	$f(x, y)$
$(1, 0)$	1
$(-1, 0)$	-1

The first point is the max, which is 1.