Full name: _____ Key _____   **GT ID:**_____   **Sec:**____

Quiz 6 Version A

You have 15 minutes to take the quiz. No phones, notes, or use aids of any kind is permitted.

1. (10 points) [**Lagrange Multipliers**]
   Find the maximum and minimum value of $f(x, y)$ subject to the constraint $g(x, y) = k$ using the method of Lagrange multipliers. [AJN]

$$f(x, y) = x^2 y, \text{ subject to } x + y = 3.$$

$f(x,y) = x^2 y, \text{ subject to } g(x,y) = x + y = 3.$

Set up $\nabla f = \langle 2xy, x^2 \rangle \qquad \nabla g = \langle 1, 1 \rangle$

Solve $\begin{cases} ① 2xy = \lambda \\ ② x^2 = \lambda \\ ③ x + y = 3 \end{cases}$

Use ① & ② w/ $\lambda = \lambda$ to get

$2xy = x^2 \Rightarrow x^2 - 2xy = 0 \Rightarrow x(x - 2y) = 0$

CASE I.   CASE II.
So $x = 0$ or $x = 2y$.

In Case I. $x = 0, y = 3, \lambda = 0$ get $(0, 3)$

In Case II. $\begin{cases} ① 4y^2 = \lambda \\ ② 3y = 3 \end{cases} \Rightarrow y = 1 \ \& \ \lambda = 4.$

get $(2, 1)$.

Evaluate

(x,y)	$f(x,y)$	
$(0,3)$	0	← MIN
$(2,1)$	4	← MAX

So MAX of f is 4 at $(2,1)$
MIN of f is 0 at $(0,3)$