Name: **Key**

Calculus 251:C3   **Quiz #11 - 6/15/2020**   **Topic: Section 14.8**

Instructions. Answer the questions in the spaces provided or on your own paper, then scan and upload to Canvas. Show and label all of your work. Responses with no work may receive no credit even if the answer is correct.

10 pts

(1) Find the minimum and maximum values of the function $f(x,y) = 2xy$ subject to the constraint $2x^2 + 3y^2 = 12$, and indicate the points at which these values occur.
You must use the method of Lagrange multipliers to earn any credit on this quiz.

$$\nabla f = \langle 2y, 2x \rangle$$

$$g(x,y) = 2x^2 + 3y^2 - 12$$

$$\nabla g = \langle 4x, 6y \rangle$$

$$\nabla f = \lambda \nabla g$$

① $2y = 4\lambda x \implies 3y^2 = 6\lambda xy$

② $2x = 6\lambda y \implies 2x^2 = 6\lambda xy$

$\Big\}\, 2x^2 = 3y^2$

③ $2x^2 + 3y^2 = 12$

$\implies 2x^2 + 2x^2 = 12$

$x^2 = 3$

$x = \pm\sqrt{3}$

$y = \pm\sqrt{2}$

Candidate point	$f(x,y)$
$(\sqrt{3}, \sqrt{2})$	$2\sqrt{6}$
$(-\sqrt{3}, \sqrt{2})$	$-2\sqrt{6}$
$(\sqrt{3}, -\sqrt{2})$	$-2\sqrt{6}$
$(-\sqrt{3}, -\sqrt{2})$	$2\sqrt{6}$

Max of $2\sqrt{6}$ at $(\sqrt{3}, \sqrt{2})$ and $(-\sqrt{3}, -\sqrt{2})$

Min of $-2\sqrt{6}$ at $(-\sqrt{3}, \sqrt{2})$ and $(\sqrt{3}, -\sqrt{2})$