Math 240, Quiz #8, Summer 2017 Name KEY

Instructions: Show all work. Use exact answers unless specifically asked to round.

1. Use the method of Lagrange multipliers to maximize the function subject to the given constraint(s) $w = x^2 - 10x + y^2 - 14y + 28$, subject to $x + y = 10$

$\nabla w = \lambda \nabla g$

$-10 + 2x = \lambda$

$2y - 14 = \lambda$

$-10 + 2x = 2y - 14$

$2x - 2y = -4$

$x - y = -2$

$w = 4^2 - 10(4) + 6^2 - 14(6) + 28 = \boxed{36}$

$g = x + \cancel{y} - 10 = 0$

$x - \cancel{y} + 2 = 0$

$2x - 8 = 0$

$2x = 8$

$x = 4$

$x - y = -2$

$4 - y = -2$

$-y = -6$

$y = 6$

$\boxed{(4, 6)}$

2. Set up a double integral and use it to evaluate the volume over the region R. $\iint_R \sin x \sin y \, dA$;

R: rectangle with vertices $(-\pi, 0)$, $(\pi, 0)$, $(\pi, \frac{\pi}{2})$, $(-\pi, \frac{\pi}{2})$. Sketch the region in the plane.

$$\int_0^{\pi/2}\int_{-\pi}^{\pi} \sin x \sin y \, dx\, dy =$$

$$\int_0^{\pi/2} \sin y \, dy \left[-\cos x \right|_{-\pi}^{\pi} = \int_0^{\pi/2} [-(-1) + (-1)] \sin y \, dy$$

$$= \int_0^{\pi/2} 0 \cdot \sin y \, dy = \boxed{0}$$