Score: ____________

Name: ______________________________________________

# Worksheet 6 - Section 15.4, 15.7 (Due Tues, Nov. 4)

**Math 2110Q – Fall 2014**

**Professor Hohn**

You must show all of your work to receive full credit!

1. Use a double integral to find the area of the region inside the cardioid $r = 1 + \cos\theta$ and outside the circle $r = 3\cos\theta$.

2. Evaluate the integral

$$\int_0^2 \int_0^{\sqrt{2x-x^2}} \sqrt{x^2+y^2}\, dy\, dx$$

by converting to polar coordinates.

3. We define the improper integral (over the entire plane $\mathbb{R}^2$)

$$\iint\limits_{\mathbb{R}^2} e^{-(x^2+y^2)}\,dA = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} e^{-(x^2+y^2)}\,dA = \lim_{a\to\infty} \iint\limits_{D_a} e^{-(x^2+y^2)}\,dA$$

where $D_a$ is the disk with radius $a$ and center at the origin. Show that

$$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} e^{-(x^2+y^2)}\,dA = \pi.$$

4. Evaluate the triple integral

$$\iiint\limits_E xy\,dV$$

where $E$ is bounded by the parabolic cylinders $y = x^2$ and $x = y^2$ and the planes $z = 0$ and $z = x + y$.