Group: _____ _____ _____ Name: _____

Math 231 A. Worksheet 18.

1. Consider the parametric curve $x = \sin^2 t$, $y = \sin 3t$, $0 \le t \le \pi/3$. Set up but do not evaluate integrals which represent the following:

a) The area under the curve.

b) The surface area created by rotating the curve about the x-axis.

c) The surface area created by rotating the curve about the line $y = 5$.

d) The surface area created by rotating the curve about the y-axis.

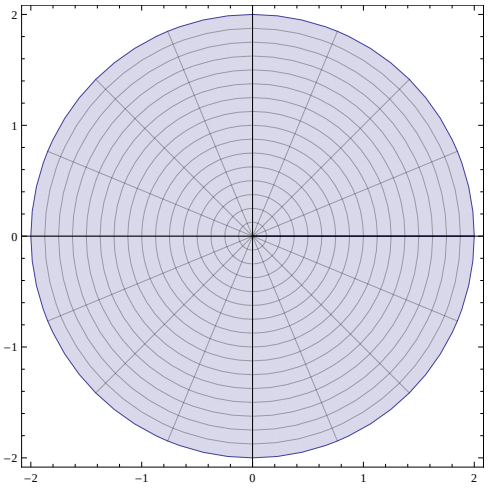
2. A sphere of radius r is formed by rotating the semicircle

$$x = r\cos\theta, \quad y = r\sin\theta, \quad -\frac{\pi}{2} \le \theta \le \frac{\pi}{2}$$

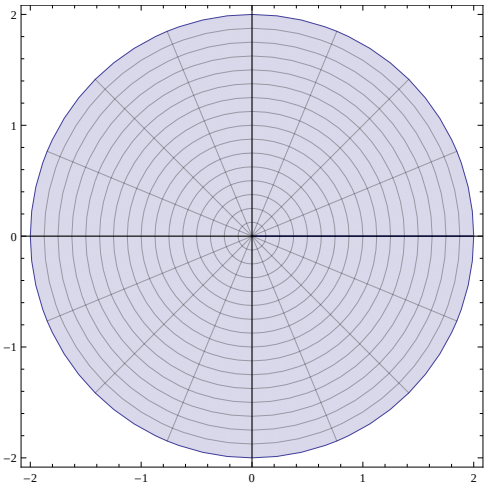
about the y axis. Sketch a graph. Then compute the surface area of the sphere.

3. Sketch the regions

a) $1 \leq r \leq 2$, $-\frac{\pi}{3} \leq \theta \leq \frac{\pi}{4}$.



b) $r \leq 0$, $\frac{4\pi}{3} \leq \theta \leq \frac{5\pi}{3}$.



Recall: To convert from polar to rectangular (Cartesian) coordinates, we use

$$x = r\cos\theta, \qquad y = r\sin\theta.$$

To convert from rectangular to polar coordinates, we use

$$y/x = \tan\theta, \qquad x^2 + y^2 = r^2.$$

4. Identify each polar curve by finding a Cartesian equation.

a) $\theta = \frac{\pi}{3}$

b) $r = 2\sin\theta$

5. Find a simple polar equation which represents each of the following.

a) $y = 3x$

b) $y = 4x^2$