1 Questions:

11.3 #8: Find the polar equation of the line $y = 1/2x$. The equation is $\theta = \tan^{-1}(1/2)$

2 Problems:

1. Find the surface area of a sphere of radius R.

$$S = 2\pi \int_a^b y\sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}\, dt$$

The parametric equations for a semi-circle of radius R are $x = R\cos(t)$ and $y = R\sin(t)$ for $0 \le t \le R$. Now:

$$\frac{dx}{dt} = -R\sin(t)$$
$$\frac{dy}{dt} = R\cos(t)$$
$$\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2 = R^2\sin^2(t) + R^2\cos^2(t) = R^2.$$
$$S = 2\pi \int_0^\pi R^2\sin(t)\, dt = 2\pi R^2(-\cos(t))]_0^\pi = 2\pi R^2 + 2\pi R^2 = 4\pi R^2.$$

2. Convert the equation $r = \sin(\theta)$ to rectangular coordinates.

3. Convert the equation $r = \dfrac{1}{2 - \cos(\theta)}$ to rectangular coordinates.

4. Convert the equation $x = 5$ to polar coordinates.

5. Sketch the curve $r = \cos(2\theta)$.