1. Convert the following polar equations to their corresponding Cartesian equations (no \( \theta \)'s should survive):

   (a) \( \theta = \frac{5\pi}{6} \).
   
   (b) \( r = \sin(\theta) + \cos(\theta) \).
   
   (c) \( r = \frac{8}{\cos(\theta) + 2\sin(\theta)} \).

2. Sketch the following polar curves. Find the area and arc length (just the integral) of one “petal” of each of these.

   (a) \( r = \cos(3\theta) \).
   
   (b) \( r = \sin(2\theta) \).
   
   (c) \( r^2 = \cos(2\theta) \).
   
   (d) \( r = 1 + \sin(3\theta) \).

3. In this problem, we learn how to use polar equations to tilt curves.

   (a) Let \( k > 0 \) and consider the line \( x = k \). Find its polar equation.
   
   (b) Suppose you want to tilt the straight line counter-clockwise by \( \frac{\pi}{4} \). How should the equation in (a) be changed to do this? What about a general angle \( \phi \)?
   
   (c) Find the Cartesian equation of the \( \phi \)-tilted equation found in (b).