1. Convert the Cartesian relation \( y = \sqrt{3}x \) to polar form.

2. Convert the Cartesian relation \( x^2 + y^2 = 25 \) to polar form.

3. Convert the Cartesian relation \( y = x^2 - 1/4 \) to polar form (hint: let \( x = r \cos \theta \), \( y = r \sin \theta \), and add \( r^2 \sin^2 \theta \) to both sides).

4. Sketch a graph of the spiral \( r = \theta \) for \( 0 \leq \theta \leq 4\pi \).

5. Let \( a \) and \( b \) be positive constants. Convert the polar relation \( r = a \cos \theta + b \sin \theta \) to Cartesian (hint: multiply both sides by \( r \)). Show that you get a circle and find the center and radius of the circle.

6. In class we said that if a line doesn’t pass through the origin then it has an equation of the form

\[
r = \frac{d}{\cos(\theta - \alpha)}
\]

where \( d \) is the (perpendicular) distance of the line to the origin and \( \alpha \) is the angle made by a perpendicular dropped from the origin to the line. Show that this equation can be rewritten in the form

\[
x \cos \alpha + y \sin \alpha = d
\]

(hint: use a trigonometric identity).

7. Sketch a graph of the cardioid \( r = 1 + \cos \theta \).

8. Sketch a graph of the spiral \( r = e^\theta \) (we could also write \( \ln r = \theta \)).