

## Homework Sec 10.3

(Please use your own paper. Please leave plenty of space between each answer).

1. Consider the point  $\left(-2, \frac{3\pi}{4}\right)$  in polar coordinates.
  - a. Graph the point.
  - b. Give two alternative representations for the point (in polar coordinates).
  - c. Express the point in Cartesian coordinates.
  
2. Consider the point  $(1, -2)$  in Cartesian coordinates. Give two alternative representations (in polar coordinates) for the point. Hint: You can write  $\arctan(2)$  or use a calculator to approximate it.
  
3. Consider the polar equation  $r^2 \cos 2\theta = 1$ .
  - a. Convert the polar equation to Cartesian equation.
  - b. Identify the curve. Hint: See page 678, Sec 10.5.
  
4. Consider the polar equation  $r = \tan \theta \sec \theta$ .
  - a. Convert the polar equation to Cartesian equation.
  - b. Identify the curve.
  - c. Put in the polar equation on desmos.com to graph the curve. Sketch it - label at least three points. Type 'theta' for the angle. <https://www.desmos.com/calculator/zpwigtyct1>
  - d. Put in the Cartesian equation on desmos.com and verify that you get the same curve.
  
5. Consider the Cartesian equation  $x^2 + y^2 = 4x$ .
  - a. Convert the Cartesian equation  $x^2 + y^2 = 4x$  to polar equation.
  - b. Put in the polar equation on desmos.com and sketch the curve - label at least three points.
  - c. Put in the Cartesian equation on desmos.com and verify that you get the same curve.
  
6. Convert the Cartesian equation  $xy = 4$  to polar equation.
  
7. Sketch the graph of the polar equation  $r = 4 \sin 3\theta$  without technology. Then plot the polar equation with desmos.com. Type:  $r = 4 \sin(3 \theta)$ . <https://www.desmos.com/calculator/zpwigtyct1>
  
8. Sketch the graph of the polar equation  $r = 1 - 2 \sin \theta$  without technology. Then verify your graph with desmos.com. <https://www.desmos.com/calculator/zpwigtyct1>
  
9. Find the slope of the tangent line of the curve  $r = 4 \cos 2\theta$  when  $\theta = \frac{\pi}{4}$ . Graph the curve using desmos.com so that you can estimate that the slope you've computed makes sense.
  
10. Find the points on the cardioid  $r = 1 + \sin \theta$  where the tangent line is horizontal and where the tangent line is vertical.  
 Answer: You only need to check when the theta is between 0 and 2pi. Copy Example 9 page 664.