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/zpwigtyctl
   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/zpwigtyctl

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/zpwigtyctl

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.