Problem Set 2

1a. Plot the point with polar coordinates $(2, \frac{-2\pi}{3})$ and convert to Cartesian coordinates.

1b.Convert $(-1, \sqrt{3})$ to polar coordinates where $r > 0$ and $0 \leq \theta \leq 2\pi$, then convert to polar coordinates where $r < 0$ and $0 \leq \theta \leq 2\pi$.

2. Sketch the region in the plane that satisfies $1 \leq r \leq 3$ and $\frac{\pi}{6} \leq \theta \leq \frac{5\pi}{6}$.

3a. Convert the polar equation $r = 2 \cdot \cos(\theta)$ to a Cartesian equation.

3b. Convert the Cartesian equation $y = 1 + 3x$ to a polar equation.

4. Sketch the curve of $r = 4 \cdot \sin(3\theta)$.

5. For the polar curve, $r = 2 - \sin(\theta)$, what is the slope of the tangent line at $\theta = \frac{\pi}{3}$? At what points is the tangent line horizontal or vertical?

6. Find the area bounded by the curve $r = \cos(\theta)$ in the region $0 \leq \theta \leq \frac{\pi}{6}$.

7. Sketch the curve of $r = 1 - \sin(\theta)$ and find the area it encloses.

8. Find the area of the region that lies inside $r = 3 \cdot \cos(\theta)$ and outside $r = 1 + \cos(\theta)$.

9. Find the points of intersection for the two curves, $r = 1 + \sin(\theta)$ and $r = 3 \cdot \sin(\theta)$.

10. Find the length of the polar curve, $r = 2 \cdot \cos(\theta)$ for $0 \leq \theta \leq \pi$.