**Pre-Calculus Review: CHAPTER 6**   Name: _____

1. Given $A(4,2), B(-3,5), C(-1,0), D(-2,-3)$. Find the following:
   a. $2\overrightarrow{CD} - \overrightarrow{AB}$ b. $\overrightarrow{AD} + \overrightarrow{AB}$ c. $\overrightarrow{DB} - 3\overrightarrow{AC}$

2. Find the magnitude and direction angle for each of the following vectors:

   a. $W = \langle 2, -5 \rangle$ b. $V = \langle -3, 1 \rangle$ c. $2W - 4V$

3. An airplane is flying at a bearing of $200°$ at 400mph. The wind is blowing at 30mph at a bearing of $60°$.

   a. Find the component form of the velocity of the plane.

   b. Find the component form of the velocity of the wind.

   c. Find the actual speed of the plane considering the wind.

   d. Find the direction of the plane considering the wind.

4. Johnny practices kicking field goals at an angle of $60°$ with the ground, at a velocity of 80 ft/s. The uprights have a crossbar 10 feet high and are 40 horizontal yards away from Johnny when he kicks. (Notice the distance in yards!)

   a. Write a parametric equation to represent the situation.

   b. How high is the football after 2 seconds?

   c. How far will the ball travel before hitting the ground? How long was it in the air for?

   d. Will Johnny make the field goal?

5. Eliminate the parameter from the given parametric equation: $x(t) = 3 - 5t \ \ y(t) = 5t^2 + 4$

6. Convert the polar coordinates to rectangular form.

   a. $\left(4, \frac{5\pi}{6}\right)$ b. $\left(-4, \frac{-\pi}{3}\right)$

7. Convert the rectangular coordinates to polar form. Represent each in three different ways.

   a. $\left(3\sqrt{3}, -3\right)$ b. $(-2, 5)$

8. Graph the following polar coordinates:

   a. $\left(-3, \frac{4\pi}{3}\right)$ b. $\left(-2, \frac{-5\pi}{4}\right)$
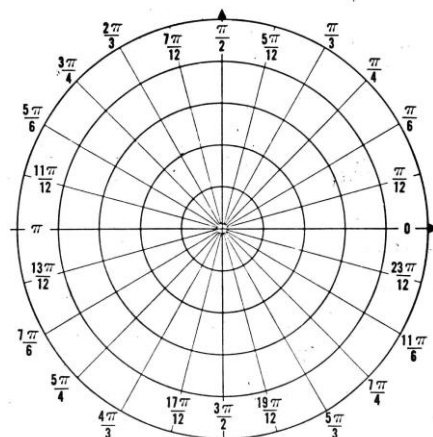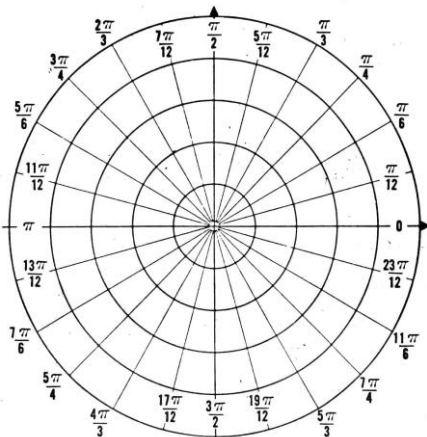
9. Consider the following rose curves. For each, find how many petals each has, the length of the petals, and the symmetry.

   a. $r = 3 \sin 2\theta$ b. $r = 4 \cos 3\theta$ c. $r = \sin 4\theta$

10. Sketch the limacon curve $r = 3 + 2 \sin \theta$

11. Given the following vectors, find the dot product and angle between the vectors:

    a. $\langle 2, 3 \rangle$ and $\langle 1, -2 \rangle$ b. $\langle -5, 0 \rangle$ and $\langle 3, 8 \rangle$ c. $\langle 4, 12 \rangle$ and $\langle -1, 2 \rangle$

12. Find the rectangular form of the polar equation $r = \frac{2}{1 + \cos \theta}$.

13. Convert the rectangular equation $3x + 4y = 2$ to polar form.

14. Convert the polar equation $r = 4 \cos \theta - 4 \sin \theta$ to rectangular form.

15. Convert the polar equation $r \sec \theta = 3$ to rectangular form.