Chapter 8 - Polar Coordinates, Vectors, Parametrics

For numbers 1 and 2, do each of the following:

    a) Plot the point.
    b) Name three other coordinates for the point. List two with the same r value and one with the opposite r value.
    c) Find its rectangular coordinates. Please give exact values.

1. $(2, \pi/6)$

2. $(-4, 7\pi/6)$

3. The rectangular coordinates of a point are given. Find polar coordinates for each point. Please give θ in **radians** and use **exact values** where appropriate**.**

    a) $(-\sqrt{3}, 1)$

    b) $(5, -12)$

4. Write the equation $r = 2 \sin\theta$ in rectangular form. Then name the graph and fully describe its characteristics.

5. Convert $4x^2 + 4y^2 = 12$ to polar form.

6. Consider the equation r = 3 – 3sinθ. What is the name of its graph? How do the numbers in the equation give this away without graphing?

7. Consider the equation r = 2sin6θ. What is the name of its graph? Describe how the numbers in the equation affect the graph.

8. Suppose **v = 6i – 3j** and **w = -2i + 5j**.   Find:

   a)   2v – 3w

   b) |w – v|

   c)   v · w

   d)   The angle between v and w (in **degrees**)

9. Are the vectors parallel, orthogonal, or neither? Why?
         v = -2i – 8j;   w = i + 4j

10. Find a so that the vectors are orthogonal.
    v = ai – 2j and **w = 3i +9j**

11. A small motorboat in still water maintains a speed of 8mph. In heading directly across a river (that is, perpendicular to the current) whose current is 3mph, find a vector representing the speed and direction of the motorboat in ai + bj form. What is the true speed of the motorboat?

12. A ball is thrown with an initial speed of 32 mph at an angle of 60° to the horizontal.   Find the force vector v for the ball in terms of i and j.

13. Write a single equation using only x and y that is equivalent to the pair of parametric equations. (y should be expressed in terms of x.) $x = t – 3$; $y = |2t – 5|$

14. Imagine that a car is moving with the given speed at the given angle. Write parametric equations for the horizontal and vertical components of each motion in terms of the sine and cosine of an acute angle. 25 ft/s at 36° from the x-axis

15. Write parametric equations to simulate the motion and use them to find how long it will take for the ball to hit the ground. Round to the nearest hundredth.

    A golfer swings a club with a loft of 42° and an initial velocity of 128 ft/s on level ground.