

Name:

Date:

Quiz 5

Precalculus - Hargus

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**Instructions:** Please **show all work** (partial credit will be given for correct work, even if your answer is wrong).

1. (15 points) Let  $\mathbf{u} = \langle 5, 3 \rangle$  and  $\mathbf{v} = \langle -1, 2 \rangle$ . Write your answers in component form.

a)  $3\mathbf{v} =$

b)  $\mathbf{u} + 2\mathbf{v} =$

c)  $\mathbf{u} \cdot \mathbf{v} =$

2. (5 points) Find the angle between the vectors  $\mathbf{u} = \langle 5, 3 \rangle$  and  $\mathbf{v} = \langle -1, 2 \rangle$ .

Angle = \_\_\_\_\_

3. (10 points) Eliminate the parameter  $t$  from the following parametric equations. For your answer, write  $y$  in terms of  $x$ .

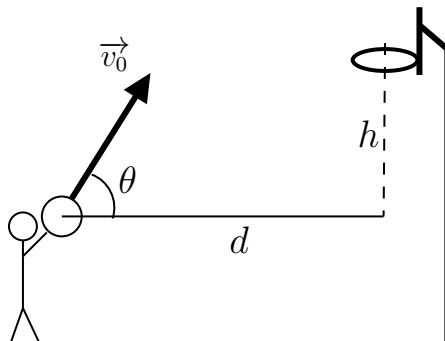
a)  $x = t - 1$   
 $y = t^2 + 4t$

$y =$  \_\_\_\_\_

b)  $x = 3 \cos(t)$   
 $y = 3 \sin(t)$

$y =$  \_\_\_\_\_

4. (15 points) Steven shoots and makes a basket from a horizontal distance of  $d = 10$  ft from a basketball hoop. The basketball has initial velocity  $v_0 = 20$  ft/s and an initial angle of  $\theta = 50^\circ$ .



- a) What is the component of the initial velocity in the vertical  $y$ -direction  $v_{0_y}$ ?

$$v_{0_y} = \underline{\hspace{2cm}}$$

- b) After what length of time  $t$  has the ball traveled a horizontal distance of  $d = 10$  ft?

$$t = \underline{\hspace{2cm}}$$

- c) What is the height  $h$  of the basketball above where it was shot (see diagram above) at the time  $t$  you found in part (b)? Hint: remember that the height of a flying object is given by  $y = -16t^2 + v_{0_y}t + y_0$ .

$$h = \underline{\hspace{2cm}}$$

5. (5 points) Convert the equation  $r \sec(\theta) = 3$  to rectangular form (using only  $x$  and  $y$ ). Write your answer in the standard form for a circle  $(x - a)^2 + (y - b)^2 = c^2$ , where  $a$ ,  $b$ , and  $c$  are constants.

Rectangular form: \_\_\_\_\_

6. (5 points) Show that the graph of the polar equation  $r = 1 + 2 \cos(\theta)$  is symmetric across the  $x$ -axis, using a symmetry test.

7. (10 points) True or false? (circle your answer)

a) If  $\mathbf{u}$  and  $\mathbf{v}$  are vectors, then  $\mathbf{u} \cdot \mathbf{v} = \mathbf{v} \cdot \mathbf{u}$  **T** or **F**

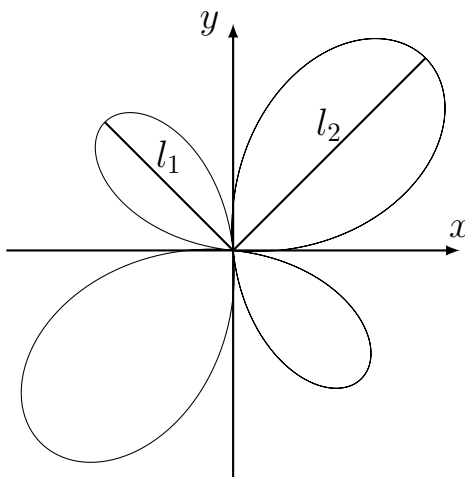
b) If  $\mathbf{u}$  and  $\mathbf{v}$  are vectors, then  $|\mathbf{u}||\mathbf{v}| = \mathbf{u} \cdot \mathbf{v}$  **T** or **F**

c) If  $\mathbf{u}$  and  $\mathbf{v}$  are nonzero vectors, then  $\mathbf{u}$  and  $\mathbf{v}$  are parallel if and only if  $\mathbf{u} \cdot \mathbf{v} = 0$ . **T** or **F**

d) The polar coordinates  $(2, -\frac{\pi}{2})$  and  $(-2, \frac{5\pi}{2})$  are the same point. **T** or **F**

e) The distance between any two points in polar coordinates  $(r_1, \theta_1)$  and  $(r_2, \theta_2)$  is  $|r_1 - r_2|$ . **T** or **F**

8. (10 points) The graph of  $r = 5 \sin(2\theta) + 1$  is shown below. What are the lengths of the petals  $l_1$  and  $l_2$ ?



$l_1 =$  \_\_\_\_\_

$l_2 =$  \_\_\_\_\_