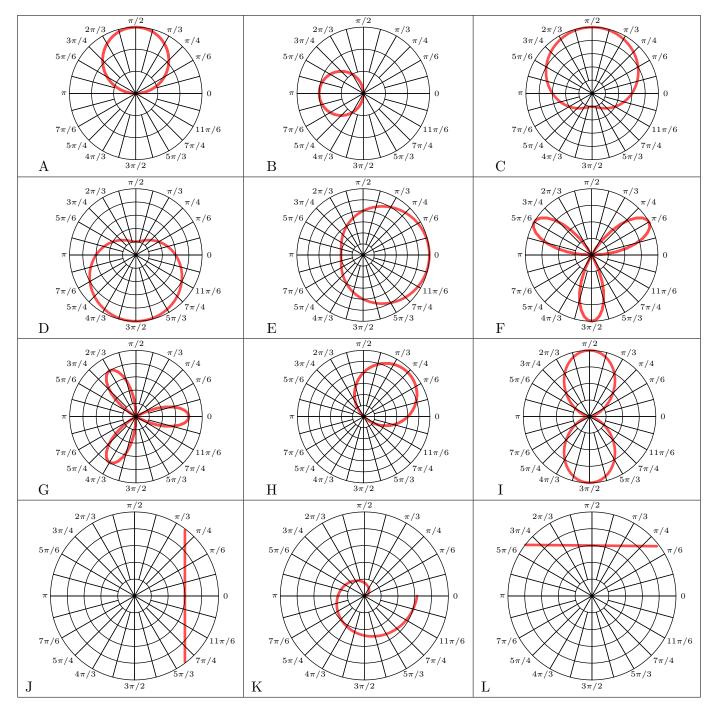
## Matching – 1 pt each question



1. 
$$r = -2\cos(\theta)$$
 \_\_\_\_\_

2. 
$$r = 4\cos(3\theta)$$
 \_\_\_\_\_

3. 
$$r = 3\sin(\theta)$$
 \_\_\_\_\_

4. 
$$r = 3 - 2\sin(\theta)$$

5. 
$$r = 4\sin(\theta) + \cos(\theta)$$
 \_\_\_\_\_

6. 
$$r = 4\sin(3\theta)$$
 \_\_\_\_\_

7. 
$$r = 3\csc(\theta)$$
 \_\_\_\_\_

8. 
$$r = 4\sin^2(\theta)$$
 \_\_\_\_\_

9. 
$$r = \theta/2$$
 \_\_\_\_\_

10. 
$$r = 4 + 2\cos(\theta)$$
 \_\_\_\_\_

11. 
$$r = 3 + 2\sin(\theta)$$
 \_\_\_\_\_

12. 
$$r = 3\sec(\theta)$$
 \_\_\_\_\_

## Multiple Choice - 2 pts each

Work must be shown for credit.

- 1. Convert the polar coordinate to rectangular coordinates:  $(-2, 2\pi/3)$ 
  - A.  $(1, 1/\sqrt{3})$
  - B.  $(1, -\sqrt{3})$
  - C.  $(1, \sqrt{3})$
  - D.  $(\sqrt{3}, 1)$
  - E.  $(-1, 1/\sqrt{3})$
- 2. Convert the polar coordinate to rectangular coordinates:  $(4, -\pi/2)$ 
  - A. (4,0)
  - B. (4, -4)
  - C. (0,4)
  - D. (0, -4)
  - E. (-4,0)
- 3. Convert the rectangular coordinate to polar coordinates:  $(15, 5\sqrt{3})$ 
  - A.  $(10\sqrt{3}, \frac{\pi}{6})$
  - B.  $(\sqrt{30}, \frac{\pi}{6})$
  - C.  $(10\sqrt{3}, \frac{\pi}{3})$
  - D.  $(10\sqrt{3}, \frac{\pi}{3})$
  - E.  $(10\sqrt{3}, \frac{\pi}{4})$
- 4. Convert the rectangular coordinate to polar coordinates: (-12,-12) A.  $\left(12\sqrt{2},-\frac{3\pi}{4}\right)$ 

  - B.  $(12\sqrt{2}, -\frac{\pi}{4})$
  - C.  $(2\sqrt{12}, \frac{3\pi}{4})$
  - D.  $(2\sqrt{12}, -\frac{5\pi}{4})$
  - E.  $(12\sqrt{2}, \frac{3\pi}{4})$

5. Convert the rectangular equation to polar:  $x^2 + y^2 = 16$ 

A. 
$$r = 4$$

B. 
$$r = 4\sin\theta$$

C. 
$$r = 16$$

D. 
$$r = 16\sin\theta$$

E. 
$$r = \frac{16}{2\sin\theta}$$

6. Convert the rectangular equation to polar: 2xy = 1

A. 
$$r = \frac{1}{2(\sin\theta + \cos\theta)}$$

B. 
$$r^2 = \frac{1}{2\sin\theta\cos\theta}$$

C. 
$$r^2 = 1 - 2\sin(\theta)\cos(\theta)$$

D. 
$$r^2 = \frac{1}{2}\sec(\theta)\cot(\theta)$$

E. 
$$r = \frac{1}{2\sin(2\theta)}$$

7. Convert the polar equation to rectangular:  $\theta = 2\pi/3$ 

A. 
$$y = -(1/\sqrt{3})x$$

B. 
$$x + y = \sqrt{3}$$

C. 
$$y = -\sqrt{3}x$$

D. 
$$y = \sqrt{3}x$$

- E. None of the above
- 8. Convert the polar equation to rectangular:  $r = \frac{2}{1 + \sin \theta}$

A. 
$$x^2 - y^2 = (x + y)$$

B. 
$$x^2 + xy - y^2 = 4$$

C. 
$$x^2 + y^2 = (y - 2)^2$$

D. 
$$x^2 + y^2 + y = 4$$

E. 
$$x^2 - y^2 = 2(x+y)$$

5.	
-	

- 9. Find the intersection points of  $r = 3\cos\theta$  and  $r = \sqrt{3}\sin\theta$ 
  - A.  $\{4\pi/3, 7\pi/3\}$
  - B.  $\{2\pi/3, 4\pi/3\}$
  - C.  $\{\pi/3, 5\pi/6\}$
  - D.  $\{5\pi/6, 11\pi/6\}$
  - E.  $\{\pi/3, 4\pi/3\}$

9. \_\_\_\_\_

## Free Response Section

## Calculator Active

A remote control drone is flying in the air and casts a shadow onto an xy plane below. Its shadow on the xy-plane has position (x(t), y(t)) at time  $t \ge 0$  with

$$\frac{dx}{dt} = \sqrt{3t}$$
 and  $\frac{dy}{dt} = 3\cos\left(\frac{t^2}{2}\right)$ 

The particle is at position (2,5) at time t=4.

1. Find the acceleration vector at time t = 4.

2. Find the y-coordinate of the position of the shadow at time t=1.

3. On the interval  $0 \le t \le 4$ , at what time does the speed of the shadow first reach 3.2 ?

4. Find the total distance traveled by the shadow over the time interval  $0 \le t \le 5$ .