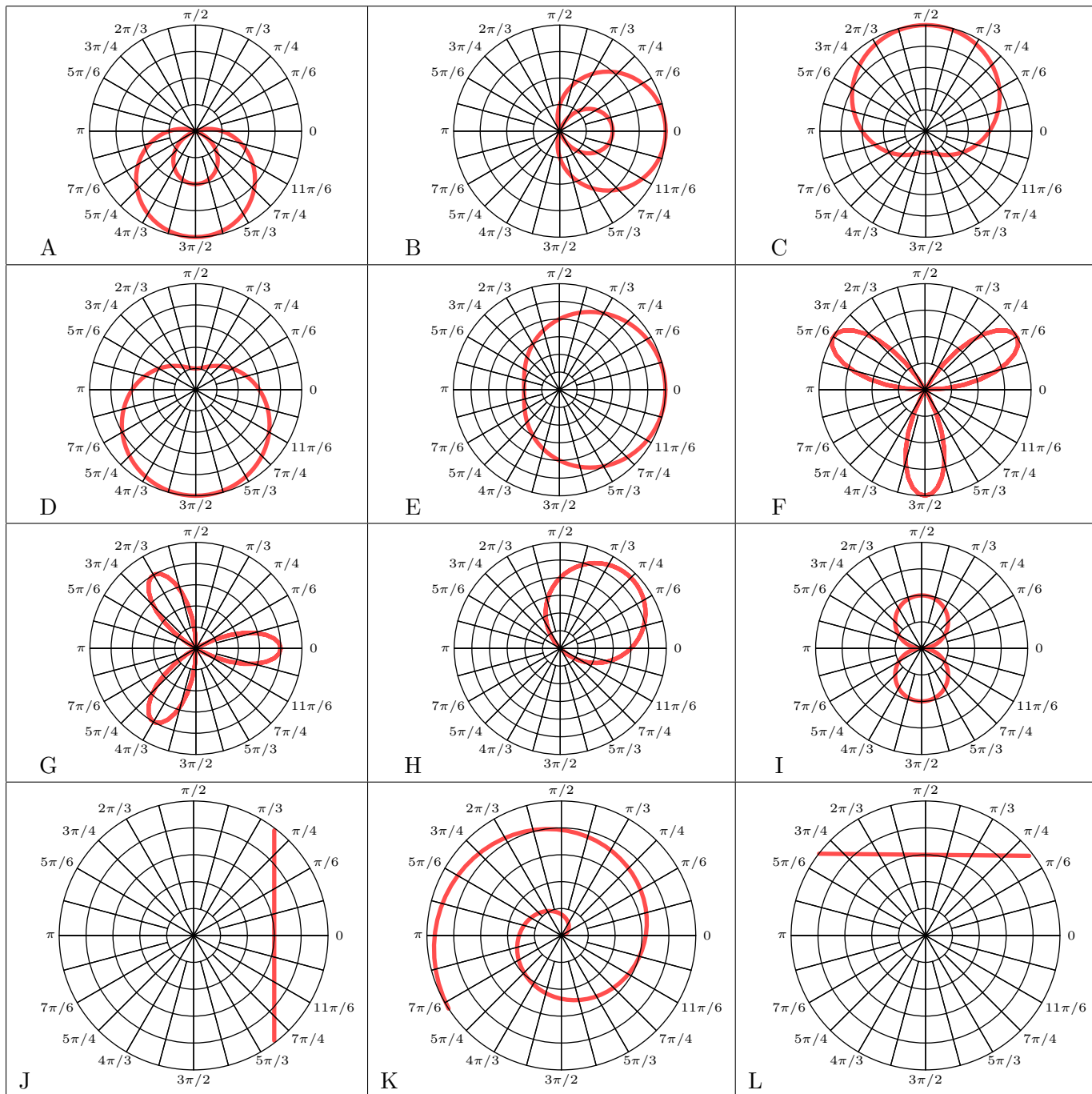


# Matching – 1 point each question



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

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

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

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

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

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

7.  $r = 1 - 3 \sin(\theta)$  \_\_\_\_\_

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

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

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

11.  $r = 1 + 3 \cos(\theta)$  \_\_\_\_\_

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

**Short Answer – 2 pts each**

Work must be shown for credit.

1. Convert the polar coordinate to rectangular coordinates:  $(-2, 2\pi/3)$

1. \_\_\_\_\_

2. Convert the polar coordinate to rectangular coordinates:  $(4, -\pi/2)$

2. \_\_\_\_\_

3. Convert the rectangular coordinate to polar coordinates:  $(15, 5\sqrt{3})$

3. \_\_\_\_\_

4. Convert the rectangular coordinate to polar coordinates:  $(-12, -12)$

4. \_\_\_\_\_

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

5. \_\_\_\_\_

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

6. \_\_\_\_\_

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

7. \_\_\_\_\_

8. Convert the polar equation to rectangular:  $r = \frac{2}{1 + \sin \theta}$

8. \_\_\_\_\_

9. Find the intersection points of  $r = 3 \cos \theta$  and  $r = \sqrt{3} \sin \theta$

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

## Free Response Section

### Calculator Active

At time  $t$ , a particle moving in the  $xy$ -plane is at position  $(x(t), y(t))$ , where  $x(t)$  and  $y(t)$  are not explicitly given. For  $t \geq 0$ ,  $\frac{dx}{dt} = 4t + 1$  and  $\frac{dy}{dt} = \sin(t^2)$ . At time  $t = 0$ ,  $x(0) = 0$  and  $y(0) = -4$ .

1. Find the speed of the particle at time  $t = 3$ .
2. Find the acceleration vector of the particle at time  $t = 3$ .
3. Find the slope of the line tangent to the path of the particle at time  $t = 3$ .
4. Find the position of the particle at time  $t = 3$ .
5. Find the total distance traveled by the particle over the time interval  $0 \leq t \leq 3$ .