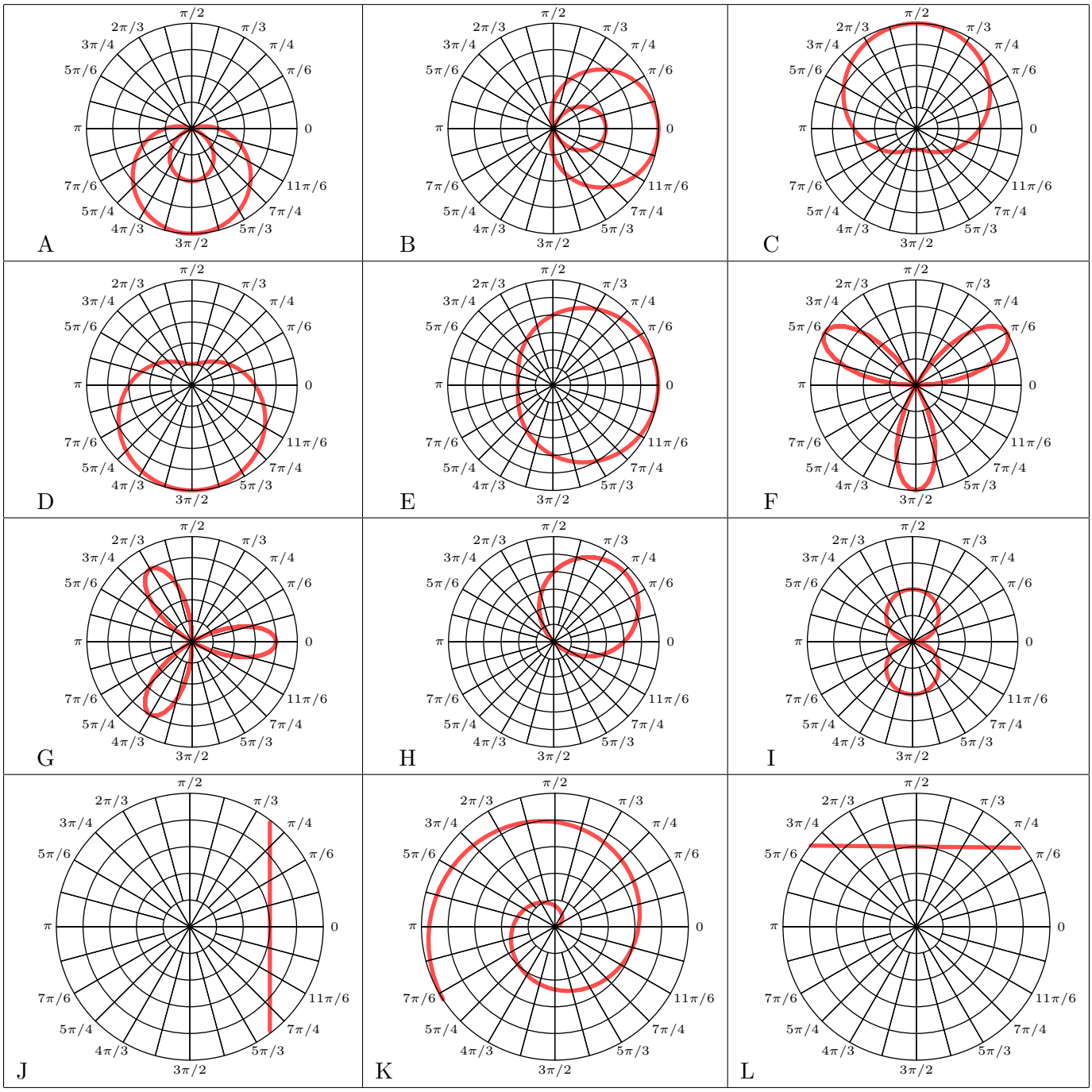
Matching – 1 point each question



1. $r = 4\cos(3\theta)$ **G**
2. $r = 4 + 2\cos(\theta)$ **E**
3. $r = 3\csc(\theta)$ **L**
4. $r = 4\sin(3\theta)$ **F**
5. $r = \theta/2$ **K**
6. $r = 4\sin(\theta) + 4\cos(\theta)$ **H**
7. $r = 1 - 3\sin(\theta)$ **A**
8. $r^2 = 4\sin^2(\theta)$ **I**
9. $r = 3 + 2\sin(\theta)$ **C**
10. $r = 3 - 2\sin(\theta)$ **D**
11. $r = 1 + 3\cos(\theta)$ **B**
12. $r = 3\sec(\theta)$ **J**

Short Answer – 2 pts each

Work must be shown for credit.

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

1. $\left(1, -\sqrt{3}\right)$

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

2. $(0, -4)$

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

3. $\left(10\sqrt{3}, \frac{\pi}{6}\right)$

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

4. $\left(12\sqrt{2}, -\frac{3\pi}{4}\right)$

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

5. $r = 4$

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

6. $r^2 = \dfrac{1}{2\sin\theta\cos\theta}$

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

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

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

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

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

9. $\{\pi/3, 4\pi/3\}$

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 $\frac{dy}{dt} = \sin\left(t^2\right)$. 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 $0 \leq t \leq 3$.