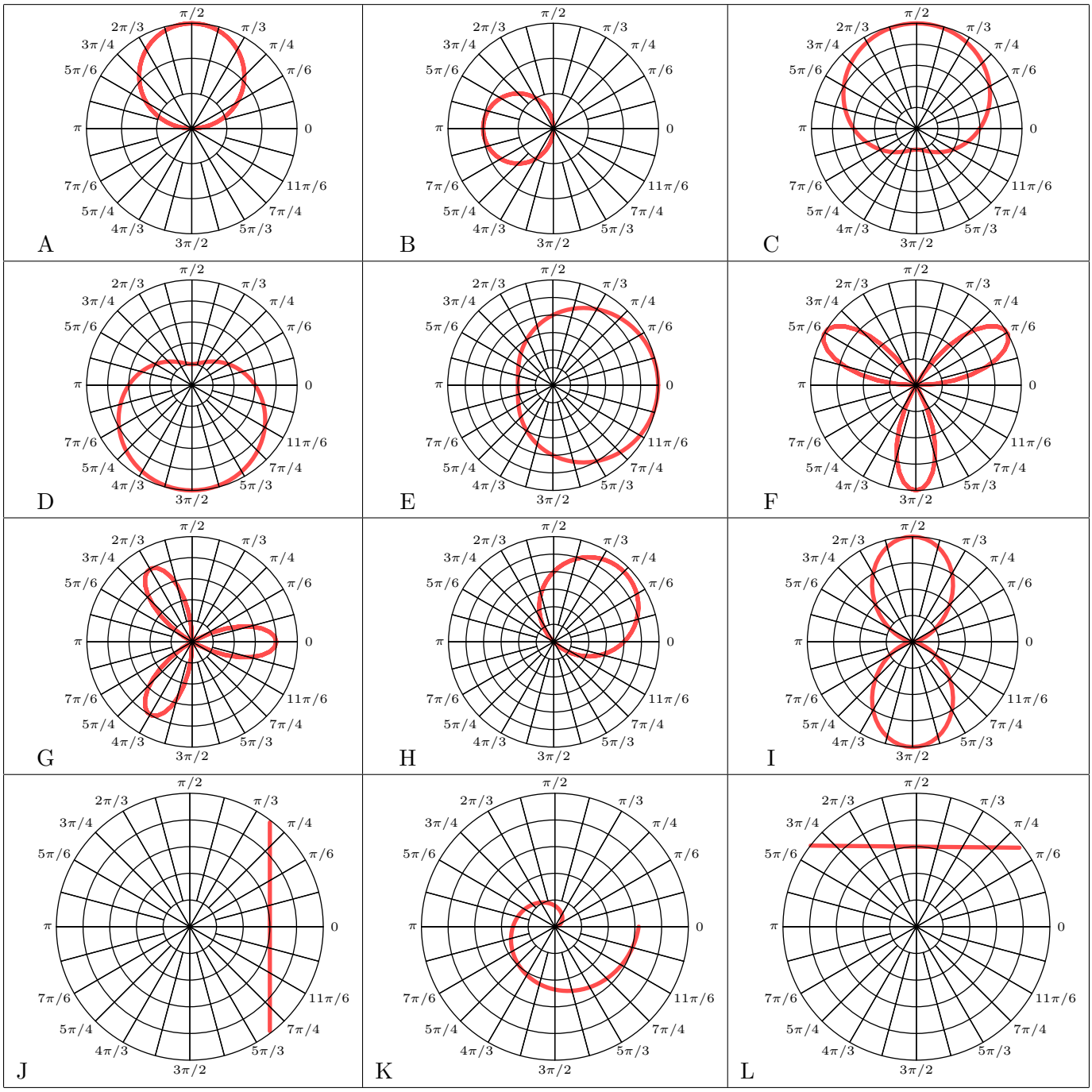
Matching – 1 pt each



1. $r = 3\sin(\theta)$ _____
2. $r = -2\cos(\theta)$ _____
3. $r = 3 + 2\sin(\theta)$ _____
4. $r = 3 - 2\sin(\theta)$ _____
5. $r = 4 + 2\cos(\theta)$ _____
6. $r = 4\sin(3\theta)$ _____
7. $r = 4\cos(3\theta)$ _____
8. $r = 4\sin(\theta) + \cos(\theta)$ _____
9. $r = 4\sin^2(\theta)$ _____
10. $r = 3\sec(\theta)$ _____
11. $r = \theta/2$ _____
12. $r = 3\csc(\theta)$ _____

Multiple Choice – 2 pts each

Work must be shown for credit.

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

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

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

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

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

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

1. _____

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

   A. $(0, -4)$

   B. $(0, 4)$

   C. $(4, 0)$

   D. $(-4, 0)$

   E. $(4, -4)$

2. _____

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

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

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

   C. $\left(\sqrt{30}, \frac{\pi}{6}\right)$

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

   E. $\left(10\sqrt{3}, \frac{\pi}{4}\right)$

3. _____

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

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

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

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

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

   E. $\left(2\sqrt{12}, -\frac{5\pi}{4}\right)$

4. _____

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

A. $r = 4$

B. $r = 16$

C. $r = \dfrac{16}{2\sin\theta}$

D. $r = 4\sin\theta$

E. $r = 16\sin\theta$

5. _____

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

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

B. $r = \dfrac{1}{2\sin(2\theta)}$

C. $r = \dfrac{1}{2(\sin\theta + \cos\theta)}$

D. $r^2 = \dfrac{1}{2}\sec(\theta)\csc(\theta)$

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

6. _____

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

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

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

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

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

E. None of the above

7. _____

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

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

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

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

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

E. None of the above

8. _____

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

A. $\{2\pi/3, 5\pi/3\}$

B. $\{\pi/3, 5\pi/6\}$

C. $\{4\pi/3, 7\pi/3\}$

D. $\{5\pi/6, 11\pi/6\}$

E. $\{2\pi/3, 4\pi/3\}$

9. _____

Free Response Section

Calculator Active

A particle moving along a curve in the xy-plane has position $(x(t), y(t))$ at time $t \geq 0$ with

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

The particle is at position $(1, 5)$ at time $t = 4$.

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

2. Find the y-coordinate of the position of the particle at time $t = 0$.

3. On the interval $0 \leq t \leq 4$, at what time does the speed of the particle first reach 3.5 ?

4. Find the total distance traveled by the particle over the time interval $0 \leq t \leq 4$.