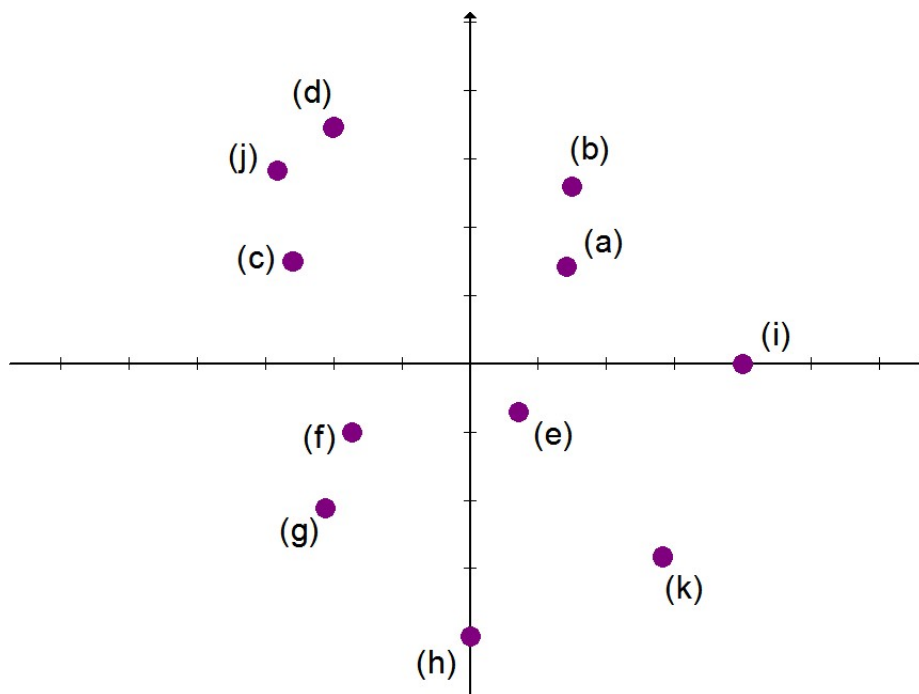


7.6 Polar Coordinates and Polar Graphs

1. Graph the points given in polar coordinates.

- (a) $(2, 45^\circ)$
- (b) $(3, 60^\circ)$
- (c) $(3, 5\pi/6)$
- (d) $(4, 2\pi/3)$
- (e) $(1, -\pi/4)$
- (f) $(2, 7\pi/6)$
- (g) $(-3, \pi/4)$
- (h) $(-4, \pi/2)$
- (i) $(-4, \pi)$
- (j) $(4, 3\pi/4)$
- (k) $(-4, 3\pi/4)$



2. Convert from polar to rectangular coordinates. Give exact values.

(a) $(2, 60^\circ)$

SOLUTION $r = 2, \theta = 60^\circ$

$$x = r \cos \theta = 2 \cos 60^\circ = 2(1/2) = 1$$

$$y = r \sin \theta = 2 \sin 60^\circ = 2(\sqrt{3}/2) = \sqrt{3}$$

ANSWER: $(1, \sqrt{3})$

(b) $(-2, 60^\circ)$ SOLUTION $(-1, -\sqrt{3})$.

(c) $(3, \pi/2)$ SOLUTION $(0, 3)$.

(d) $(4, 3\pi/4)$ SOLUTION $(-2\sqrt{2}, 2\sqrt{2})$.

(e) $(-2, 7\pi/6)$ SOLUTION $(\sqrt{3}, 1)$.

(f) $(4, -\pi/6)$ SOLUTION $(2\sqrt{3}, -2)$.

(g) $(-3, \pi)$ SOLUTION $(3, 0)$.

(h) $(2, 7\pi/4)$ SOLUTION $(\sqrt{2}, -\sqrt{2})$.

3. Convert to polar coordinates with $r \geq 0$ and θ between 0 and 2π .

(a) $(-3, 3)$

SOLUTION $x = -3, y = 3$.

$$r^2 = x^2 + y^2 = (-3)^2 + (3)^2 = 18$$

$$r = 3\sqrt{2}$$

$$x = r \cos \theta$$

$$-3 = 3\sqrt{2} \cos \theta$$

$$\cos \theta = -\sqrt{2}/2, \quad \theta \text{ is in quadrant II}$$

$$\theta = 3\pi/4$$

ANSWER: $(3\sqrt{2}, 3\pi/4)$

(b) $(-3, -3)$ SOLUTION $(3\sqrt{2}, 5\pi/4)$

(c) $(-2\sqrt{3}, 2)$ SOLUTION $(4, 5\pi/6)$

(d) $(2, -2\sqrt{3})$ SOLUTION $(4, 5\pi/3)$

(e) $(2, 0)$ SOLUTION $(2, 0)$

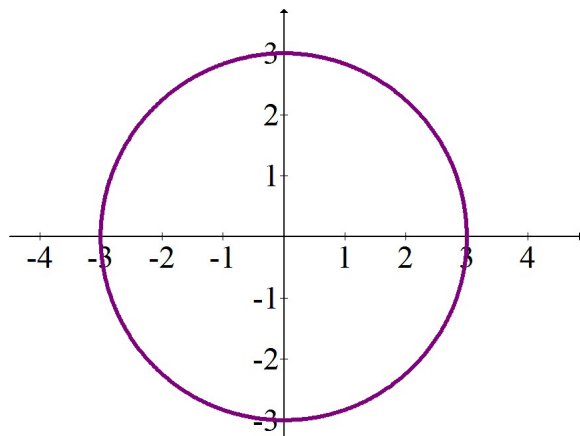
(f) $(-2, 0)$ SOLUTION $(2, \pi)$

(g) $(-\sqrt{3}, -1)$ SOLUTION $(2, 7\pi/6)$

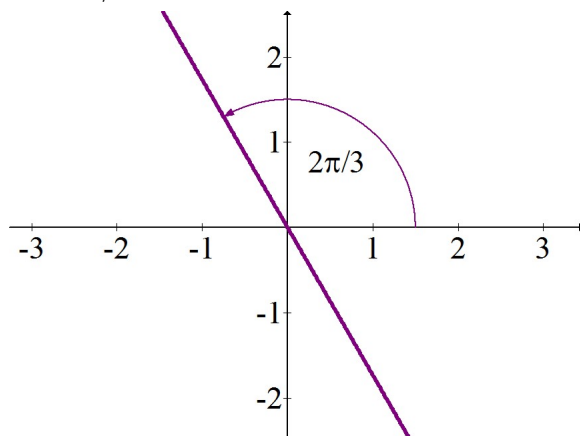
(h) $(-1, -\sqrt{3})$ SOLUTION $(2, 4\pi/3)$

4. Graph each polar equation.

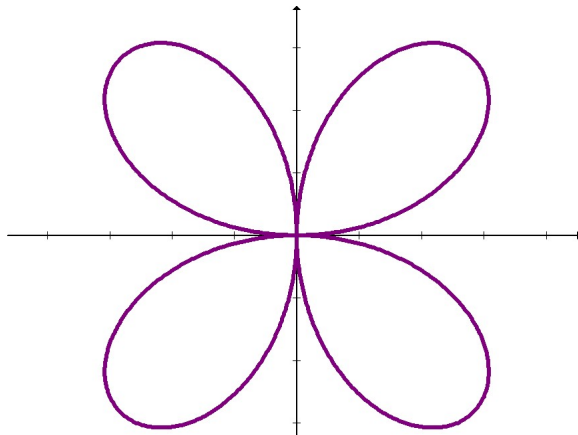
(a) $r = 3$



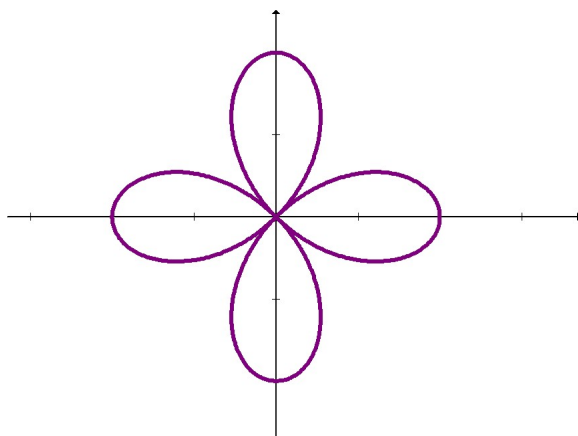
(b) $\theta = 2\pi/3$



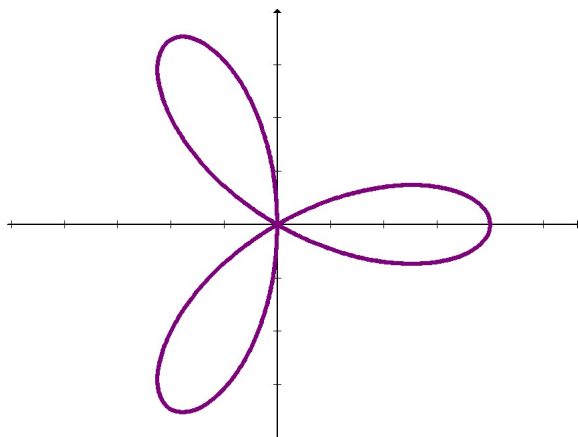
(c) $r = 4 \sin 2\theta$



(d) $r = 2 \cos 2\theta$



(e) $r = 4 \cos 3\theta$



(f) $r = 4 \sin 3\theta$

