8.2 Graphing Polar Equations

A. Write a description for each equation.

1. $r = 3 + \sin\theta$
   Limacon

2. $r = 2$
   circle

3. $r = 3\cos(2\theta)$
   rose

4. $r = 2\sin\theta + 3$
   Limacon

5. $r = 2 - 4\cos\theta$
   Limacon w/ loop

6. $r = -2\sin 5\theta$
   rose

7. $r = 3(1 + 2\sin\theta)$
   Limacon w/ Loop

8. $r = 6(1 + \cos\theta)$
   cardioid

9. $\theta = 330^0$
   line

10. $r = -8\sin\theta$
    circle

11. $r = 3\csc\theta$
    line

12. $r = 10\cos\theta$
    circle

13. $r = 4\sec\theta$
    line

B. Match each equation with a description on the right.

1. $r = 4 + 4\sin\theta$ C

2. $r = 5$ E

3. $r = 3\cos 3\theta$ D

4. $r = 2 + 3\sin\theta$ A

5. $r = 4 - 6\cos\theta$ A

6. $r = -2\sin 2\theta$ D

7. $r = 3(1 + 2\sin\theta)$ A

8. $r = 5(1 - 10\sin\theta)$ A

9. $\theta = 60^0$ F

10. $x^2 + y^2 - 10y = 0$ C

11. $r = 5 + 5\cos\theta$ F

12. $r = 4 + 3\sin\theta$ E

13. $r = 2\sec\theta$ B

14. $r = 1 + \sin\theta$ C

A. Limacon with an extra loop

B. Limacon with no extra loop

C. Cardioid

D. Rose

E. Circle

F. Line

C. Answer the following questions.

1. What is the radius of the circle $r = -7$? $\boxed{7}$

2. Given: $r = 24\sin 2\theta$

    a. What is the length of the petal? 24

    b. Where is the first petal drawn? 1st quadrant

    c. How far apart are the petals spaced? $\dfrac{2\pi}{4} = \dfrac{\pi}{2}$

    d. At what angle measures will the petals be drawn? $\dfrac{\pi}{4}, \dfrac{3\pi}{4}, \dfrac{5\pi}{4}, \dfrac{7\pi}{4}$

D. Find the r value for the given angle.

1. $r = 4\cos\theta$ for $\dfrac{\pi}{6}$

$r = 4\cos(\pi/6)$

$4\left(\sqrt{3}/2\right) = \boxed{2\sqrt{3}}$

2. $r = 3 + 3\sin\theta$ for $\dfrac{\pi}{4}$

$r = 3 + 3\sin\left(\dfrac{\pi}{4}\right)$

$3 + \dfrac{3\sqrt{2}}{2} = \boxed{\dfrac{6 + 3\sqrt{2}}{2}}$

3. $r = 4 + 2\sin\theta$ for $\dfrac{5\pi}{6}$

$r = 4 + 2\sin\left(\dfrac{5\pi}{6}\right)$

$4 + 2\left(\dfrac{1}{2}\right) = \boxed{5}$

4. $r = 2 - 4\cos\theta$ for $\dfrac{4\pi}{3}$

$r = 2 - 4\cos\left(\dfrac{4\pi}{3}\right)$

$= 2 - 4\left(-\dfrac{1}{2}\right) = 2 - (-2) = \boxed{4}$

5. $r = 5\sin 9\theta$ for $\dfrac{\pi}{6}$

$r = 5\sin\left(9 \cdot \dfrac{\pi}{6}\right)$

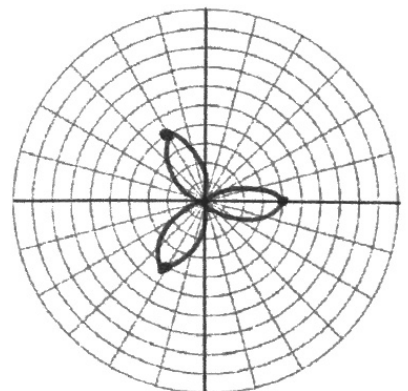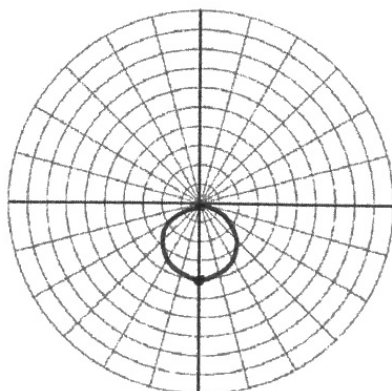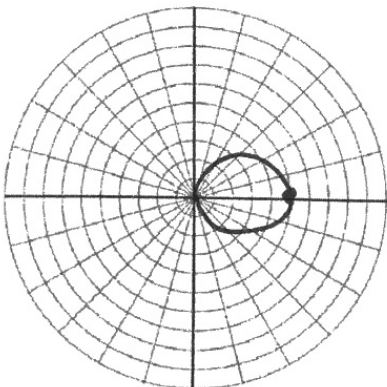$= 5\sin\left(\dfrac{3\pi}{2}\right) = \boxed{-1}$

6. $r = 4\cos 4\theta$ for $\dfrac{\pi}{4}$

$r = 4\cos\left(4 \cdot \dfrac{\pi}{4}\right)$

$= 4\cos\pi = 4(-1) = \boxed{-4}$

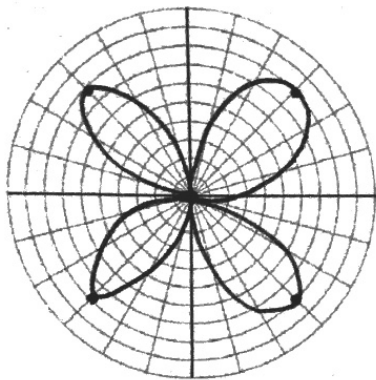## E. Graph the following polar equations.
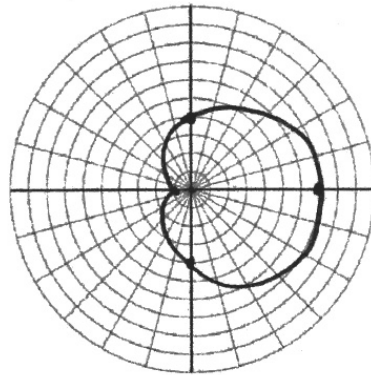
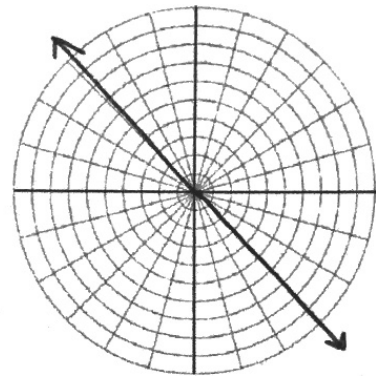1. $r = 5\cos\theta$ 2. $r = -4\sin\theta$ 3. $r = 4\cos 3\theta$

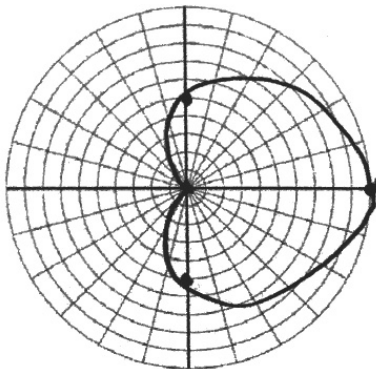**5.** $r = 8\sin 2\theta$
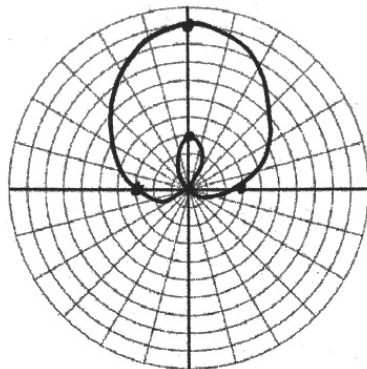
7. $r = 4 + 3\cos \theta$

9. $\theta = -\frac{\pi}{4}$

6. $r = 5 + 5\cos \theta$

8. $r = 3 + 6\sin \theta$

10. $r = 8$