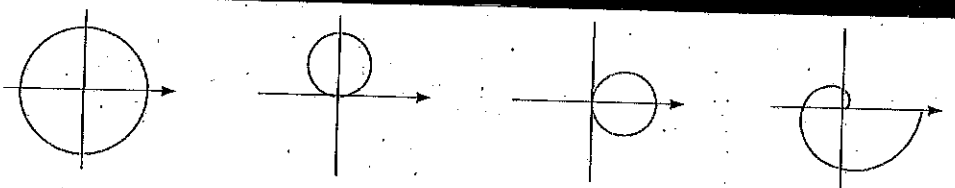
SOME COMMON POLAR CURVES

Circles and Spiral

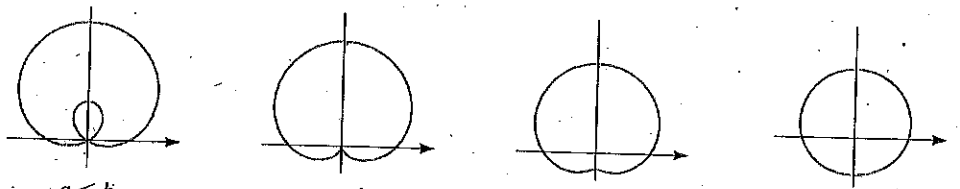


$r = a$ circle | $r = a \sin\theta$ circle | $r = a \cos\theta$ circle | $r = a\theta$ spiral

Limaçons

$r = a \pm b \sin\theta$
$r = a \pm b \cos\theta$
$(a > 0, b > 0)$

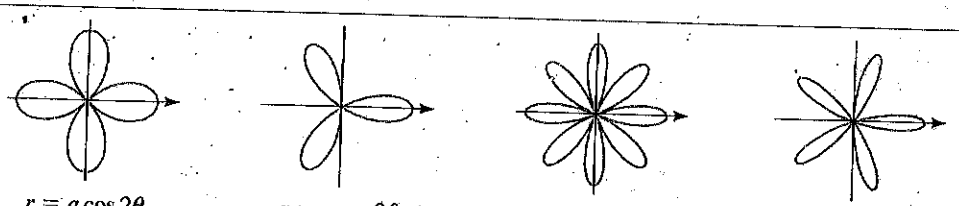
Orientation depends on the trigonometric function (sine or cosine) and the sign of b.



$a < b$ limaçon with inner loop | $a = b$ cardioid | $a > b$ dimpled limaçon | $a \geq 2b$ convex limaçon

Roses

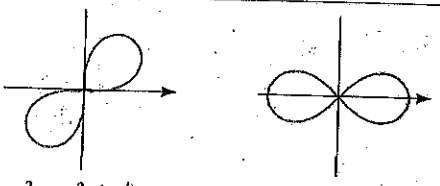
$r = a \sin n\theta$
$r = a \cos n\theta$
n-leaved if n is odd
$2n$-leaved if n is even



$r = a \cos 2\theta$ 4-leaved rose | $r = a \cos 3\theta$ 3-leaved rose | $r = a \cos 4\theta$ 8-leaved rose | $r = a \cos 5\theta$ 5-leaved rose

Lemniscates

Figure-eight-shaped curves



$r^2 = a^2 \sin 2\theta$ lemniscate | $r^2 = a^2 \cos 2\theta$ lemniscate

9.6 EXERCISES

1–6 ■ Plot the point that has the given polar coordinates. Then give two other polar coordinate representations of the point, one with $r < 0$ and the other with $r > 0$.

1. $(3, \pi/2)$ **2.** $(2, 3\pi/4)$ **3.** $(-1, 7\pi/6)$
4. $(-2, -\pi/3)$ **5.** $(-5, 0)$ **6.** $(3, 1)$

7–12 ■ Find the rectangular coordinates for the point whose polar coordinates are given.

7. $(4, \pi/6)$ **8.** $(6, 2\pi/3)$ **9.** $(\sqrt{2}, -\pi/4)$
10. $(-1, 5\pi/2)$ **11.** $(5, 5\pi)$ **12.** $(0, 13\pi)$