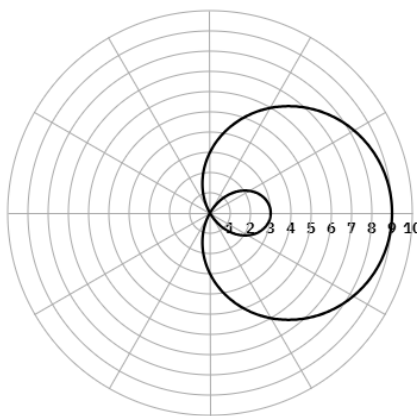


**Practice Problem 1**

The polar function  $r = f(\theta)$ , for  $0 \leq \theta \leq 2\pi$ , is given by  $f(\theta) = 4 - 3\sin(\theta)$ . Which of the following describes the limaçon?

- A. The limaçon has an inner loop.
- B. The limaçon is a cardioid.
- C. The limaçon has a dimpled shape and has an appearance of a kidney bean.
- D. The limaçon is convex and has an appearance of nearly circular.

**Practice Problem 2**



The graph of the polar function  $r = f(\theta)$ , where  $f(\theta) = 3 + 6\cos(\theta)$ , is shown in the polar coordinate system for  $0 \leq \theta \leq 2\pi$ . The inner loop of the limaçon corresponds to the values of  $\theta$  in the interval  $c < \theta < d$ . What are the values of  $c$  and  $d$ ?

- A.  $c = \frac{2\pi}{3}$  and  $d = \frac{4\pi}{3}$
- B.  $c = \frac{\pi}{3}$  and  $d = \frac{5\pi}{3}$
- C.  $c = \frac{\pi}{6}$  and  $d = \frac{5\pi}{6}$
- D.  $c = \frac{7\pi}{6}$  and  $d = \frac{11\pi}{6}$

**Solutions:**

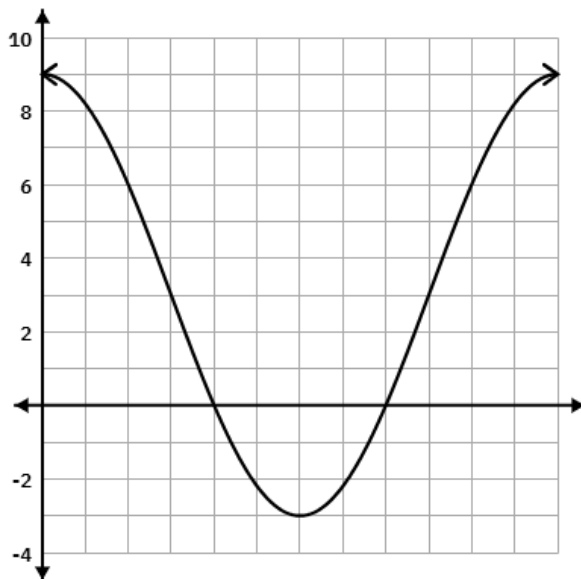
- C. The limaçon has a dimpled shape and has an appearance of a kidney bean.

The ratio of  $a$  to  $b$  is  $\frac{4}{3}$ . A limaçon in which the ratio of  $a$  and  $b$  is between 1 and 2 results in a dimpled shape or, it may be described as a kidney bean shape.

**Practice Problem 2 Solution:**

- A.  $c = \frac{2\pi}{3}$  and  $d = \frac{4\pi}{3}$

The graph of the corresponding sinusoidal function  $f(x) = 3 + 6\sin(x)$  shown to the right has gridline spacing of  $\frac{\pi}{6}$  on the interval  $[0, 2\pi]$ . The sinusoidal function has negative  $y$ -values on the interval  $(\frac{2\pi}{3}, \frac{4\pi}{3})$ . The negative  $y$ -values on the sinusoidal function correspond to the negative  $r$ -values of the polar function and those values create the inner loop.



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