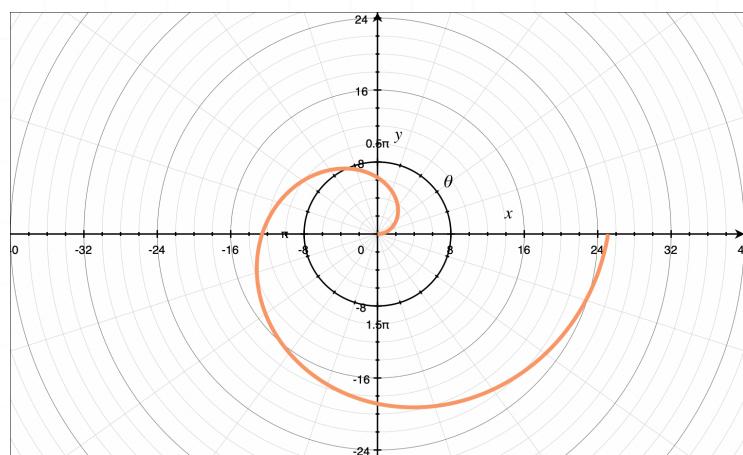


Topic: Sketching polar curves

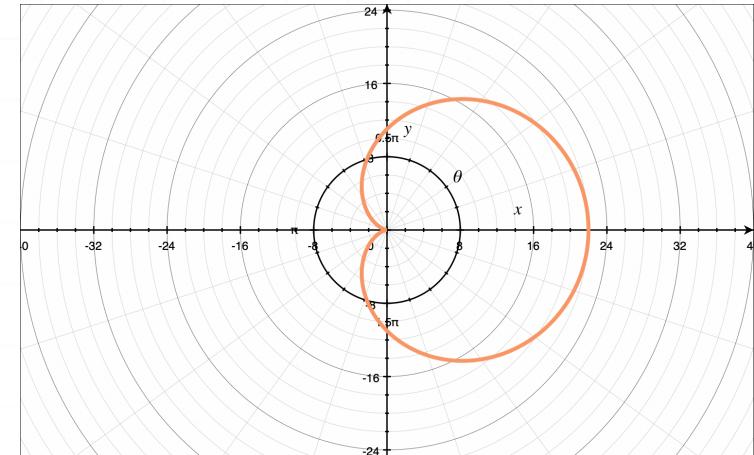
Question: Match the polar curve to its graph.

$$r = 11 + 11 \cos \theta$$

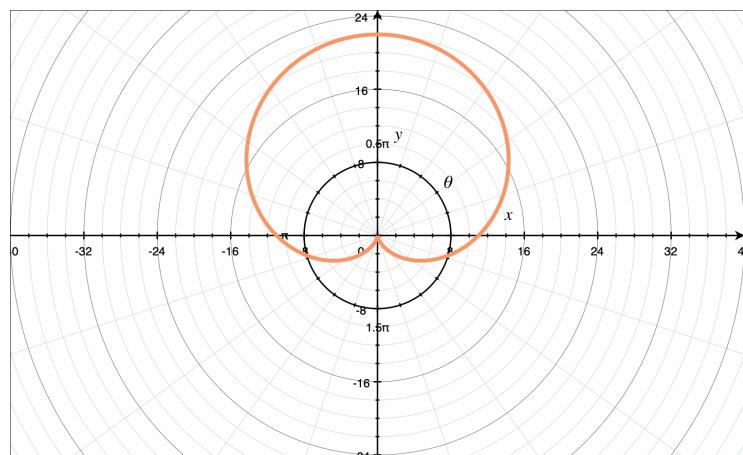
Answer choices:



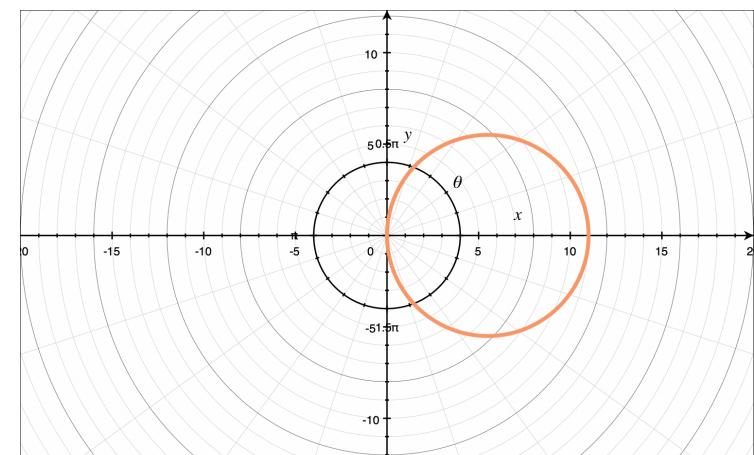
A



B



C



D

Solution: B

First we'll determine symmetries.

With respect to the x -axis by replacing θ with $-\theta$, and the test produces an equivalent equation.

$$r = 11 + 11 \cos(-\theta)$$

$$r = 11 + 11 \cos \theta$$

With respect to the y -axis by replacing θ with $\pi - \theta$, and the test does NOT produce an equivalent equation.

$$r = 11 + 11 \cos(\pi - \theta)$$

$$r = 11 - 11 \cos \theta$$

With respect to the origin by replacing r with $-r$, and the test does NOT produce an equivalent equation.

$$-r = 11 + 11 \cos \theta$$

Therefore, the graph of the polar curve is symmetric to the x -axis only, not to the y -axis or to the origin.

Below is a table of values for θ and r and the graph of the polar curve.

θ	r
0	22
$\pi/2$	11

π 0

$3\pi/2$ 11

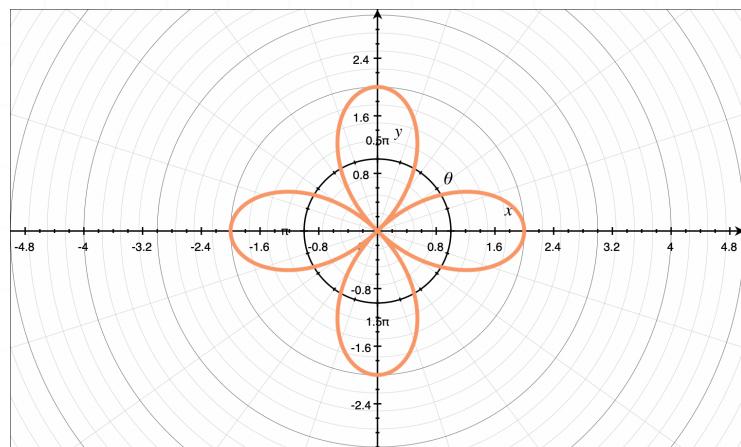
2π 22

Topic: Sketching polar curves

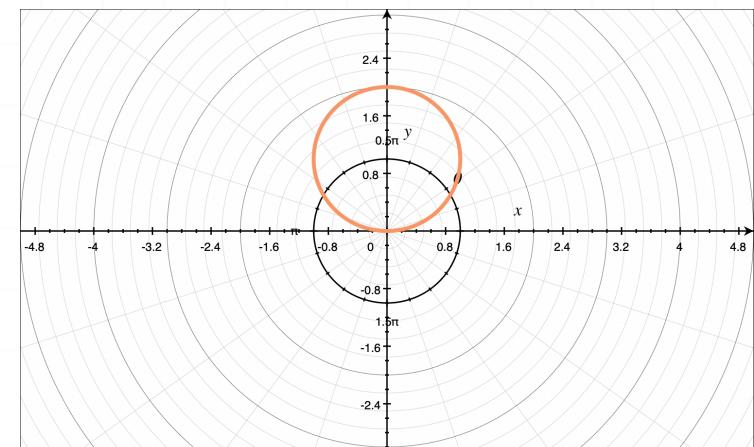
Question: Which graph represents the polar curve?

$$r = 2 \sin \theta$$

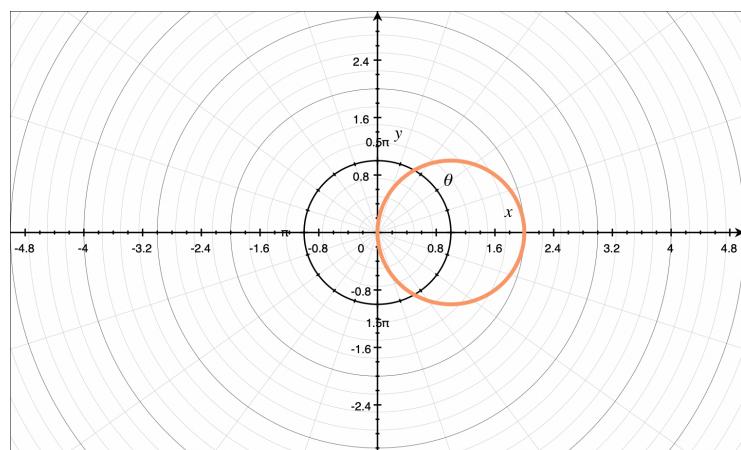
Answer choices:



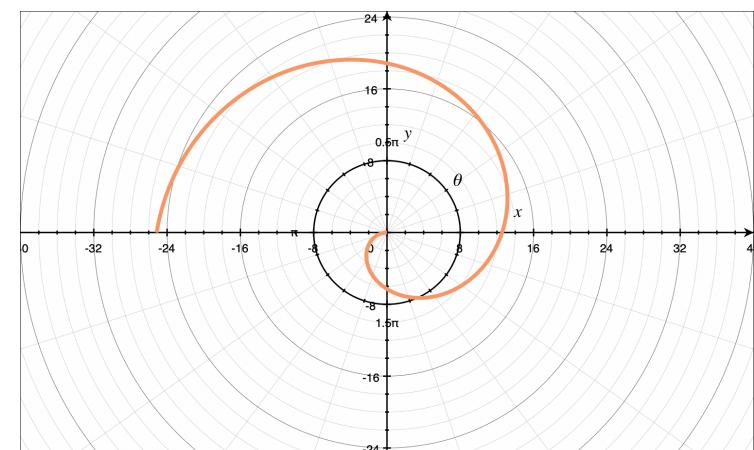
A



B



C



D

Solution: B

There are a number of ways to sketch a polar curve. If you are sketching directly on a polar graph and you are given a polar equation, you could simply choose a number of points for θ between 0 and 2π and solve for the associated r values. You could then take these points and plot them on your polar graph.

We can analyze the various potential graphs of $r = 2 \sin \theta$ by first finding some important points.

$$\theta = 0 \quad (0,0)$$

$$\theta = \frac{\pi}{2} \quad \left(2, \frac{\pi}{2}\right)$$

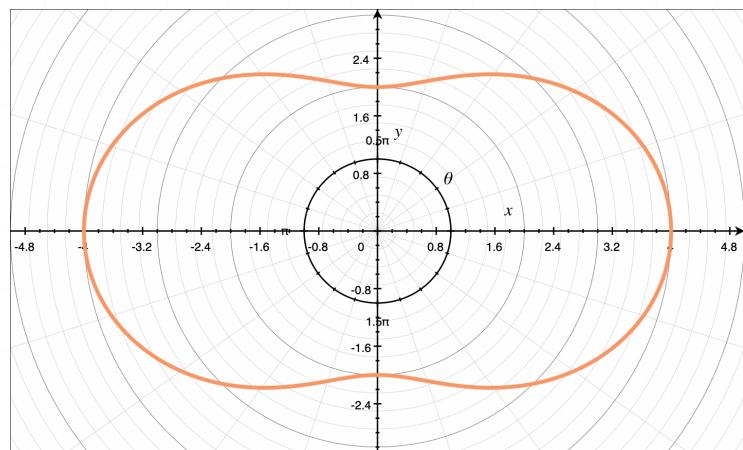
$$\theta = \pi \quad (0,\pi)$$

$$\theta = \frac{3\pi}{2} \quad \left(-2, \frac{3\pi}{2}\right)$$

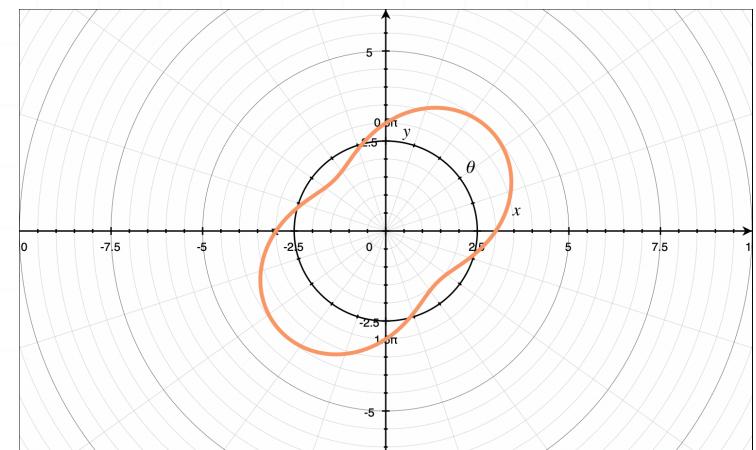
These points mean that the graph starts at $(0,0)$, then goes out to $(2,\pi/2)$, then towards $(0,\pi)$ and finally ends up at $(-2,3\pi/2)$. The only answer choice that fits this pattern is answer choice B.

Topic: Sketching polar curves**Question:** Which graph represents the polar curve?

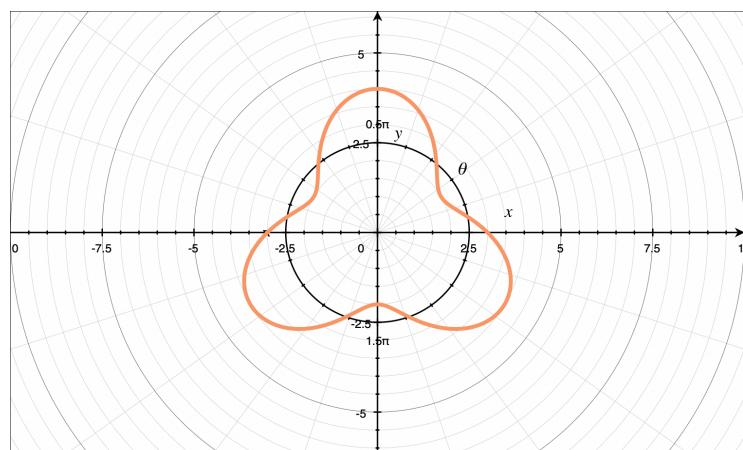
$$r = 3 + \cos 2\theta$$

Answer choices:

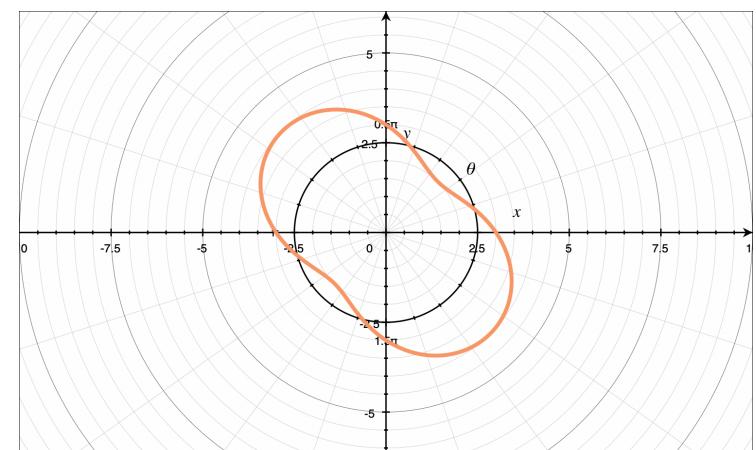
A



B



C



D

Solution: A

There are a number of ways to sketch a polar curve. If you are sketching directly on a polar graph and you are given a polar equation, you could simply choose a number of points for θ between 0 and 2π and solve for the associated r values. You could then take these points and plot them on your polar graph.

We can analyze the various potential graphs of $r = 3 + \cos 2\theta$ by first finding some important points.

$$\theta = 0 \quad (4,0)$$

$$\theta = \frac{\pi}{2} \quad \left(2, \frac{\pi}{2}\right)$$

$$\theta = \pi \quad (4,\pi)$$

$$\theta = \frac{3\pi}{2} \quad \left(2, \frac{3\pi}{2}\right)$$

These points mean that the graph starts at $(4,0)$, then goes out to $(2,\pi/2)$, then towards $(4,\pi)$ and finally ends up at $(2,3\pi/2)$. The only answer choice that fits this pattern is answer choice A.

