

Symmetry: 970-290-0550

$\theta = \frac{\pi}{2}$ Pole
 $(r, \theta) \mapsto (r, -\theta)$ or $(-r, \pi - \theta)$ $(r, \theta) \mapsto (r, \pi - \theta)$ or $(-r, -\theta)$
 $(r, \theta) \mapsto (-r, \theta)$ $(r, \theta) \mapsto (r, \pi + \theta)$

$r = 6 \sin(4\theta)$, $r = 3(1 - 2\cos\theta)$

#8 Sub $x = t+1 \Rightarrow t = x+1$

$y = \frac{t}{t-1} \Rightarrow \frac{x+1}{x+1-1} = \frac{(x+1)'}{x'} = y$

t	x	y
0	-1	0
1	0	1
2	1	2
3	2	3

$\mathcal{D}: x \neq 0 \quad \mathbb{R} \setminus \{0\}$
 - v.A. $x = 0$
 $x \rightarrow t: x+1 = 0 \Rightarrow x = -1$
 +.A.: $\frac{x+1}{x} \xrightarrow{x \rightarrow \pm\infty} \frac{x}{x} = 1$
 $y = 1$

$r = 6 \sin(4\theta)$, $0 \leq \theta \leq 2\pi$
 $0 \leq 4\theta \leq 8\pi$

$\sin 4\theta = 0$ $4\theta = 0, \pi, 2\pi, 3\pi, 4\pi, 5\pi, 6\pi, 7\pi, 8\pi$
 $\theta = 0, \frac{\pi}{4}, \frac{2\pi}{4}, \frac{3\pi}{4}, \dots, \frac{8\pi}{4}$
 $\theta = 2\pi!$

Polar Axis:
 $(r, \theta) \mapsto (r, -\theta)$
 $\mapsto (-r, \pi - \theta)$
 $-r = 4 \sin(2(\pi - \theta))$
 $= 4 \sin(2\pi - 2\theta)$
 $= 4 \sin(-2\theta)$
 $-r = -4 \sin(2\theta)$
 $r = 4 \sin(2\theta)$

Symmetry:
 $r = 4 \sin(2\theta)$
 $-r = 4 \sin(2(\pi - \theta))$
 $-r = 4 \sin(2\pi - 2\theta)$
 $-r = 4 \sin(-2\theta)$
 $-r = -4 \sin(2\theta)$
 $r = 4 \sin(2\theta)$
POLE

$\theta = \frac{\pi}{2}$:
 $r = 4 \sin(2(\pi - \theta))$
 $= 4 \sin(2\pi - 2\theta)$
 $= 4 \sin(-2\theta)$
 $= -4 \sin(2\theta)$
 $= -4 \sin(2\theta)$ No.
 $-r = 4 \sin(2(\pi - \theta))$?
 $-r = -4 \sin(2\theta)$
 $r = 4 \sin(2\theta)$
Yes!

$r = 3(1 - 2\cos\theta)$
 $= 3 - 6\cos\theta$
 $= -6\cos\theta + 3$
 Amp = 6
 Flip it (-6)
 midline $r = +3$

$3 - 6\cos\theta = 0$
 $-6\cos\theta = -3$
 $\cos\theta = \frac{1}{2}$

$\frac{\pi}{3} = 60^\circ$ or $\frac{5\pi}{3} = 300^\circ$

The image contains several graphs and annotations:

- A graph of $r = -6\cos\theta + 3$ showing a cosine wave with amplitude 6, flipped, and shifted up by 3. The midline is at $r = 3$. Key points are marked at $\theta = \frac{\pi}{3}$ and $\theta = \frac{5\pi}{3}$.
- A polar plot of the curve $r = 3(1 - 2\cos\theta)$, which is a limaçon with an inner loop. The curve is drawn in blue, and the axes are shown in red.
- A graph of $r = -6\cos\theta + 3$ with a vertical axis labeled r and a horizontal axis labeled θ . The curve crosses the θ -axis at $\theta = \frac{\pi}{3}$ and $\theta = \frac{5\pi}{3}$. The maximum value of r is 9 and the minimum is -3.