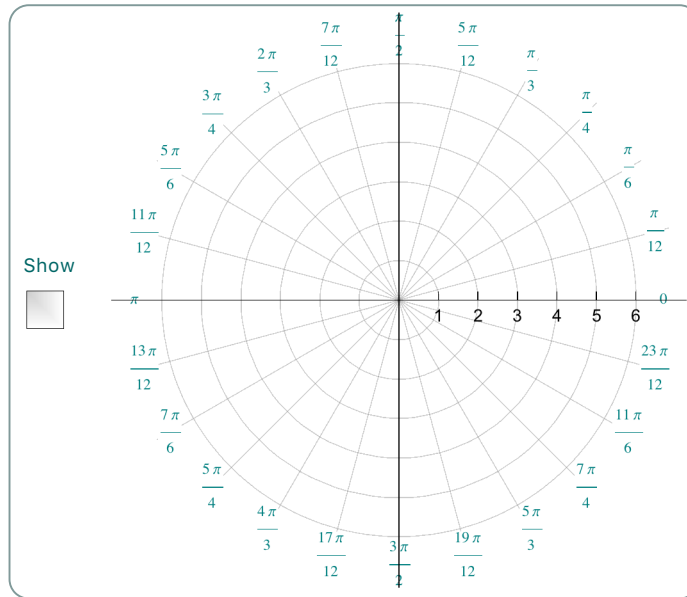


Example 4 Plot the rose $r = 5 \cos(2\theta)$, and find the slope of the tangent line when $\theta = \pi/4$ (See below). (Find the equation of the tangent line in polar form.)



Derivatives of Polar Functions

The slope, dy/dx , of polar function $r = f(\theta)$ can be found by using the parametric form $\{x = r \cos(\theta), y = r \sin(\theta)\}$ where $r = f(\theta)$.

$$\begin{aligned}
 \frac{dy}{dx} &= \frac{D_\theta[r \sin(\theta)]}{D_\theta[r \cos(\theta)]} \\
 &= \frac{D_\theta[f(\theta) \sin(\theta)]}{D_\theta[f(\theta) \cos(\theta)]} \\
 &= \frac{f'(\theta) \sin(\theta) + f(\theta) \cos(\theta)}{f'(\theta) \cos(\theta) - f(\theta) \sin(\theta)} \\
 &= \frac{r' \sin(\theta) + r \cos(\theta)}{r' \cos(\theta) - r \sin(\theta)}
 \end{aligned}$$

Example 5 Find the slope of the line tangent to $r = 3 - 2 \cos(\theta)$ when $\theta = \frac{\pi}{3}$.