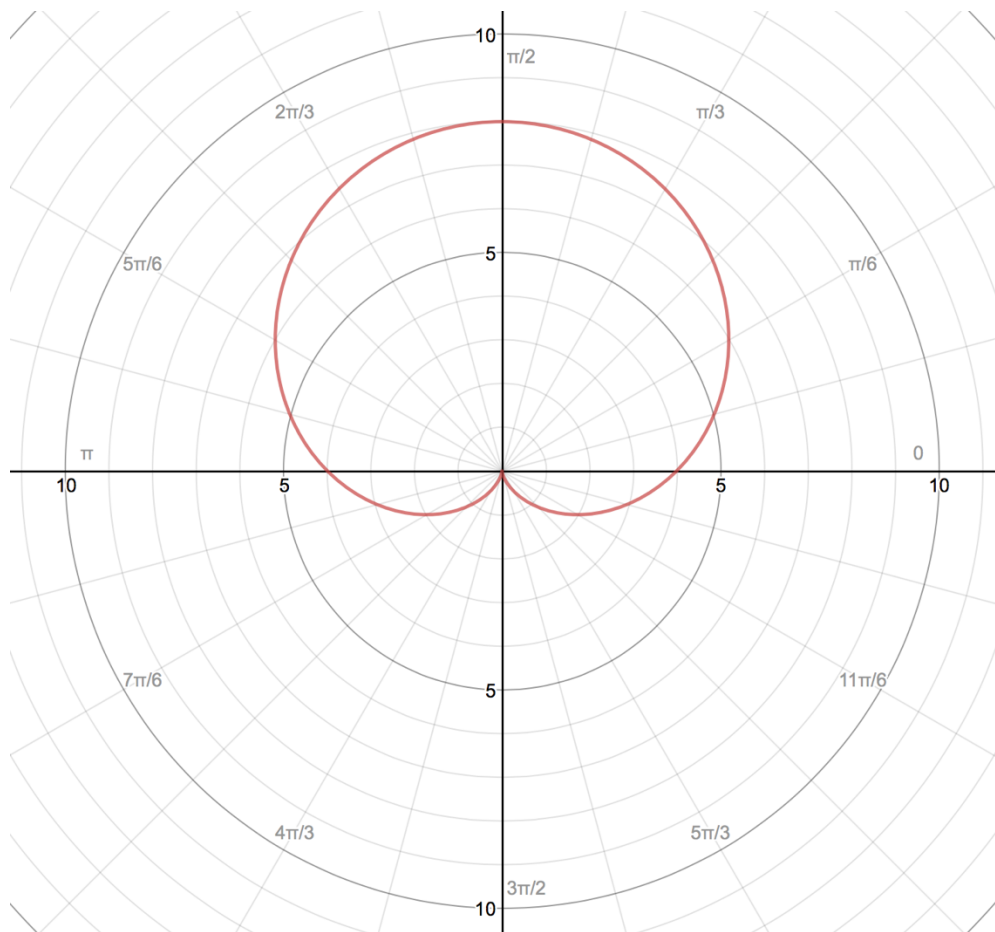


Tangent Lines to Polar Curves

Find all points where the polar curve $r = 4 + \sin\theta$, $0 \leq \theta \leq 2\pi$ has a horizontal or vertical tangent line.



$$r = f(\theta)$$

$$x = r\cos\theta = f(\theta)\cos\theta \text{ and } y = r\sin\theta = f(\theta)\sin\theta.$$

$$\frac{dy}{dx} = \frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}} = \frac{\frac{d}{d\theta}[f(\theta)\sin\theta]}{\frac{d}{d\theta}[f(\theta)\cos\theta]} = \frac{f'(\theta)\sin\theta + f(\theta)\cos\theta}{f'(\theta)\cos\theta - f(\theta)\sin\theta}$$

