

## Tangents to curves in polar coordinates.

If  $r = f(\theta)$ , then  $\frac{dr}{d\theta} > 0$  has the following

meaning: If  $r > 0$ , then points move away from the origin as  $\theta$  increases; if  $r < 0$ , then points move toward the origin as  $\theta$  increases.

$\frac{dr}{d\theta}$  has nothing to do with the slope of the tangent line to the curve, which is given by  $\frac{dy}{dx}$ . To

calculate this quantity, write

$$\frac{dy}{dx} = \frac{dy/d\theta}{dx/d\theta} = \frac{\frac{dr}{d\theta} \sin\theta + r \cos\theta}{\frac{dr}{d\theta} \cos\theta - r \sin\theta}$$

This gives the slope of the tangent line at each point by plugging in the  $\theta$ -value.