Tangents to Polar Curves; interpretation of $dr/d\theta$.

If $r = f(\theta)$, $\frac{dr}{d\theta} > 0$ means that points with

$r > 0$ move away from the origin (pole) as θ increases.

If $r < 0$, this is interpreted oppositely.

To calculate $\left(dy/dx\right)$, which is the slope of the tangent line to the curve $r = f(\theta)$ at a point, use

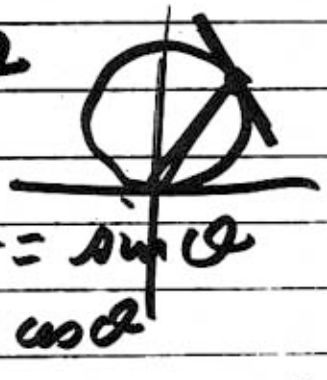
$$\left(\frac{dy}{dx}\right) = \left(\frac{dy/d\theta}{dx/d\theta}\right) = \frac{\frac{dr}{d\theta}\sin\theta + r\cos\theta}{\frac{dr}{d\theta}\cos\theta - r\sin\theta}$$

$y = r\sin\theta \qquad x = r\cos\theta$

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

$r = \sin\theta$

$\frac{dr}{d\theta} = \cos\theta$



$$\frac{dy}{dx} = \frac{\cos\theta\sin\theta + \sin\theta\cos\theta}{\cos^2\theta - \sin^2\theta}$$

$$= \frac{\sin 2\theta}{\cos 2\theta} = \tan 2\theta$$