

Conversions

$$\cos\theta = \frac{x}{r} \Rightarrow x = r\cos\theta$$

$$\sin\theta = \frac{y}{r} \Rightarrow y = r\sin\theta$$

Polar to
Rect.

$$\tan\theta = \frac{y}{x} \rightarrow \theta = \arctan\left(\frac{y}{x}\right)$$

$$\text{Rect to Polar} \left\{ \begin{array}{l} x^2 + y^2 = r^2 \Rightarrow r = \sqrt{x^2 + y^2} \end{array} \right.$$

$$\text{Polar pt } \left[4, \frac{2\pi}{3} \right] \rightarrow \text{Rect}$$

$$x = 4\cos\frac{2\pi}{3} \rightarrow 4\left(-\frac{1}{2}\right) = -2 \quad (-2, 2\sqrt{3})$$

$$y = 4\sin\frac{2\pi}{3} \rightarrow 4\left(\frac{\sqrt{3}}{2}\right) = 2\sqrt{3}$$

$$\text{Rect } (-4, -4) \rightarrow \text{Polar}$$

$$(-4)^2 + (-4)^2 = r^2 \Rightarrow r^2 = 32 \quad r = 4\sqrt{2}$$

$$\theta = \arctan(1) \Rightarrow \underline{\underline{3^{\text{rd}} \text{ Quad!}}}$$

$$\text{Polar } \left[4\sqrt{2}, \frac{5\pi}{4} \right]$$

$$\text{OR } \left[-4\sqrt{2}, \frac{\pi}{4} \right]$$

$$\theta = \frac{5\pi}{4}$$

$$(1, -\sqrt{3}) \rightarrow \text{Polar} \quad \left[2, \frac{5\pi}{3} \right]$$

Converting Eqs

① $r=3$

$$\sqrt{x^2+y^2}=3 \Rightarrow x^2+y^2=9$$

②

$$r \cdot r = 4 \cos \theta \cdot r$$

$$r^2 = 4r \cos \theta$$

$$\boxed{x^2+y^2=4x}$$

$$x = r \cos \theta$$

$$y = r \sin \theta$$

$$x^2+y^2=r^2$$

③ $r = 3 \csc \theta \Rightarrow r = \frac{3}{\sin \theta} \Rightarrow r \sin \theta = 3$

$$\boxed{y=3}$$

④ $3x-4y=6$

$$3r \cos \theta - 4r \sin \theta = 6$$

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

$$\boxed{r = \frac{6}{3 \cos \theta - 4 \sin \theta}}$$