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$r\angle\theta = r e^{j\theta}$ where θ must be in radians.

$2\left[\cos(60°) + j\sin(60°)\right] = r e^{j\theta}$.

Soln:

$60° = \frac{\pi}{3}$

$= 2e^{j\frac{\pi}{3}}$

$(re^{j\theta})^n = r^n e^{jn\theta}$

$\frac{r_1 e^{j\alpha}}{r_2 e^{j\beta}} = \frac{r_1}{r_2} e^{j(\theta - \beta)}$

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eg $e^{2+j\frac{\pi}{4}} \rightarrow a+jb$

Soln:

$e^{2+j\pi/4} = e^2 e^{j\pi/4}$

$a^{m+n} = a^m \times a^n$

$= e^2 e^{j\pi/4}$

$\boxed{r\angle\theta = r\left[\cos(\theta) + j\sin(\theta)\right]}$

$= e^2\left[\cos\left(\frac{\pi}{4}\right) + j\sin\left(\frac{\pi}{4}\right)\right]$

$= e^2\left[\frac{1}{\sqrt{2}} + j\frac{1}{\sqrt{2}}\right]$

$= \frac{e^2}{\sqrt{2}}\left[1+j\right]$

Show that

$$e^{j\theta} = \cos(\theta) + j\sin(\theta)$$

Subs $r=1$ into $re^{j\theta}$ gives

$$e^{j\theta} =$$

$$F - E + V = 2$$

$$e^{j\pi} + 1 = 0.$$

$$(2.71828\,1828\,46\ldots)^{\sqrt{-1} \times 3.14159\ldots} = -1$$

$$+1 = 0.$$

$$e^{j\pi} = \underbrace{\cos(\pi)}_{=-1} + j\underbrace{\sin(\pi)}_{=0} = -1$$

Show that $e^{-j\theta} = \cos(\theta) - j\sin(\theta)$.

<u>Soln:</u>

$$e^{-j\theta} = e^{j(-\theta)}$$

$$= \underbrace{\cos(-\theta)}_{=\cos(\theta)} + j\underbrace{\sin(-\theta)}_{-\sin(\theta)}$$

$$= \cos(\theta) - j\sin(\theta)$$

Sol:

$$v = 20 \sin(1000t - 30^\circ)$$

$$30^\circ = \frac{\pi}{6}.$$

$$v = 20 \sin\left(1000t - \frac{\pi}{6}\right).$$

$$20 e^{j\left(1000t - \frac{\pi}{6}\right)}$$

$$= 20\left[\cos\left(1000t - \frac{\pi}{6}\right) + j \sin\left(1000t - \frac{\pi}{6}\right)\right]$$

$$= 20 \cos\left(1000t - \frac{\pi}{6}\right) + j\,20 \sin\left(1000t - \frac{\pi}{6}\right)$$

$$\mathrm{Im}\left(20 e^{j\,1000t - \pi/6}\right)$$

$$\mathrm{Im}(a + jb) = b.$$

De-Moivre's Exp form

$$z = r e^{j\theta}$$

$$z^n = r^n e^{jn\theta}$$