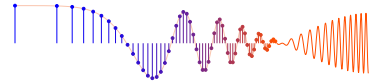


## PROBLEM:

This problem is concerned with operations on complex numbers.

(a) Find the magnitude of the complex number $(1+3j)e^{j(0.4\pi)t}$.

$|(1+3j)e^{j(0.4\pi)t}| =$

(b) Find ONE value for $\theta$ so that $\text{Re}\left\{(1+j)e^{j\theta}\right\} = 0$.

$\theta =$

McClellan, Schafer and Yoder, *Signal Processing First*, ISBN 0-13-065562-7.
Prentice Hall, Upper Saddle River, NJ 07458. 

SOLUTION

This problem is concerned with operations on complex numbers.

(a) Find the magnitude of the complex number $(1+3j)e^{j(0.4\pi)t}$.

$$|(1+3j)e^{j(0.4\pi)t}| = \sqrt{10}$$

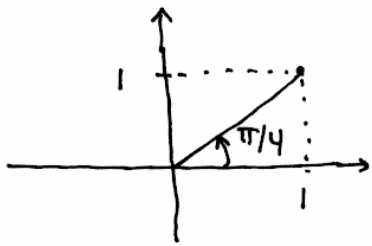
$$|(1+3j)\,e^{j(0.4\pi)t}| = |(1+3j)| \cdot \underbrace{|e^{j(0.4\pi)t}|}_{=1}$$

$$= |(1+3j)| = \sqrt{1^2+3^2} = \sqrt{10}$$

(b) Find ONE value for $\theta$ so that $\mathrm{Re}\{(1+j)e^{j\theta}\} = 0$.

$\theta = \pi/4$

$$(1+j) = \sqrt{2}\, e^{j\pi/4}$$




$$\Rightarrow (1+j)\,e^{j\theta} = \sqrt{2}\, e^{j(\theta+\pi/4)} \quad \text{and}$$

$$\mathrm{Re}\{(1+j)e^{j\theta}\} = \sqrt{2}\cos(\theta+\pi/4)$$

So $\theta = \pi/4$ works. Another way is to draw a picture. Draw the vector $(1+j)$ and note that multiplying by $e^{j\theta}$ rotates the vector by $\theta$.