



PROBLEM:

Prove DeMoivre's formula:

$$(\cos \theta + j \sin \theta)^n = \cos n\theta + j \sin n\theta$$

Then use it to evaluate $(3/5 + j4/5)^{100}$.

McClellan, Schafer and Yoder, *Signal Processing First*, ISBN 0-13-065562-7.
Prentice Hall, Upper Saddle River, NJ 07458. © 2003 Pearson Education, Inc.

SOLUTION



De Moivre:

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

$$(3/5 + j4/5)^{100} = (e^{j0.927})^{100} = (e^{j0.295167\pi})^{100} \\ = e^{j29.5167\pi} = e^{j1.5167\pi} \quad \text{BECAUSE } e^{j28\pi} = 1 \\ = \cos 1.5167\pi + j \sin 1.5167\pi \\ = \cos 273^\circ + j \sin 273^\circ = 0.0525 - j0.9986$$

===== > PROBLEM values

x345 = 0.6000 + 0.8000i

mag_of_x345 = 1

angle_x345_radians = 0.9273

angle_x345_degrees = 53.1301

prob_24 = 0.0525 - 0.9986i

mag_of_prob_24 = 1

angle_prob_24_radians = -1.5183

angle_prob_24_degrees = -86.9898

ans = 273.0102 (is same as -86.99)