Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box. Erase mistakes thoroughly.

TIP1
Problem Type Acronym

Name

ID #

Question

Using phasors, prove that

$$\cos\alpha \cos\beta = \frac{1}{2}\cos(\alpha+\beta) + \frac{1}{2}\cos(\alpha-\beta)$$

Answer

$$\frac{e^{j\alpha}+e^{-j\alpha}}{2} \cdot \frac{e^{j\beta}+e^{-j\beta}}{2} =$$

$$\frac{e^{j(\alpha+\beta)}+e^{-j(\alpha+\beta)}}{4} + \frac{e^{j(\alpha-\beta)}+e^{-j(\alpha-\beta)}}{4} =$$

$$\frac{1}{2}\cos(\alpha+\beta) + \frac{1}{2}\cos(\alpha-\beta)$$

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TIP2		
Problem Type Acronym	Name	ID #

Question

Prove that

$$\sin^2 t = \frac{1}{2}(1 - \cos 2t)$$

using phasors

Answer

$$\sin^2 t = \frac{e^{jt} - e^{-jt}}{2j} \cdot \frac{e^{jt} - e^{-jt}}{2j}$$

$$= \frac{e^{j2t} - e^{0} - e^{0} + e^{-j2t}}{-4}$$

$$= \frac{e^{j2t} + e^{-j2t} - 2}{-4} = \frac{1}{2}(1 - \cos 2t)$$

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TIP3
Problem Type Acronym

Name

ID #

Question

Using phasor representations prove

$$\sin(2t) = 2\sin(t)\cos(t)$$

Answer

$$2\left[\frac{e^{jt} - e^{-jt}}{2j}\right]\left[\frac{e^{jt} + e^{jt}}{2}\right] =$$

$$\frac{e^{2jt} - e^{-2jt}}{2j} = \sin(2t)$$

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TIP4		
Problem Type Acronym	Name	ID #

Question

Prove the following using phasors

$$\sin(\alpha)\cos(\beta) + \cos(\alpha)\sin(\beta) =$$

$$\sin(\alpha+\beta)$$

Answer

$$\left(\frac{e^{j\alpha} - e^{-j\alpha}}{2j}\right)\left(\frac{e^{j\beta} + e^{-j\beta}}{2}\right) + \left(\frac{e^{j\alpha} + e^{-j\alpha}}{2}\right)\left(\frac{e^{j\beta} - e^{-j\beta}}{2j}\right) =$$

$$\frac{e^{j(\alpha+\beta)} + \cancel{e^{j(\alpha-\beta)}} - \cancel{e^{j(\beta-\alpha)}} - e^{-j(\alpha+\beta)} + e^{j(\alpha+\beta)} - \cancel{e^{j(\alpha-\beta)}} + \cancel{e^{j(\beta-\alpha)}} - e^{-j(\alpha+\beta)}}{4j} =$$

$$\frac{e^{j(\alpha+\beta)} - e^{-j(\alpha+\beta)}}{2j} = \sin(\alpha+\beta)$$

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TIP 5

Problem Type Acronym | Name | ID #

Question

Prove the following using phasors

$\cos 2\alpha = 2\cos^2\alpha - 1$

Answer

$$\frac{e^{j2\alpha}+e^{-j2\alpha}}{2} = 2\left[\frac{e^{j\alpha}+e^{-j\alpha}}{2}\right]\left[\frac{e^{j\alpha}+e^{-j\alpha}}{2}\right]-1 =$$

$$\frac{e^{j2\alpha}+e^{j0}+e^{j0}+e^{-j2\alpha}}{2}-1 =$$

$$\frac{e^{j2\alpha}+e^{-j2\alpha}}{2}$$

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TIP6

Problem Type Acronym | Name | ID #

Question

Prove the following using phasors

$$\int \cos(\omega t)\,dt = \frac{1}{\omega}\sin(\omega t)$$

Answer

$$\cos(\omega t) = \frac{e^{j\omega t} + e^{-j\omega t}}{2}$$

$$\int \frac{e^{j\omega t}}{2}\,dt + \int \frac{e^{-j\omega t}}{2}\,dt =$$

$$\frac{1}{\omega} \cdot \frac{e^{j\omega t} - e^{-j\omega t}}{2j} = \frac{1}{\omega}\sin(\omega t)$$

Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box. Erase mistakes thoroughly.

TIP7

Problem Type Acronym | Name | ID #

Question

Prove the following using phasors

$$\cos(s)\cos(t) = \frac{\cos(s+t) + \cos(s-t)}{2}$$

Answer

$$\underbrace{\frac{e^{js} + e^{-js}}{2}}_{\cos(s)} \cdot \underbrace{\frac{e^{jt} + e^{-jt}}{2}}_{\cos(t)} =$$

$$\frac{e^{j(s+t)} + e^{-j(s+t)}}{4} + \frac{e^{j(s-t)} + e^{-j(s-t)}}{4} =$$

$$\frac{\cos(s+t)}{2} + \frac{\cos(s-t)}{2}$$