Sinusoids in Electric Circuits

APPLICATIONS TO ENGINEERING

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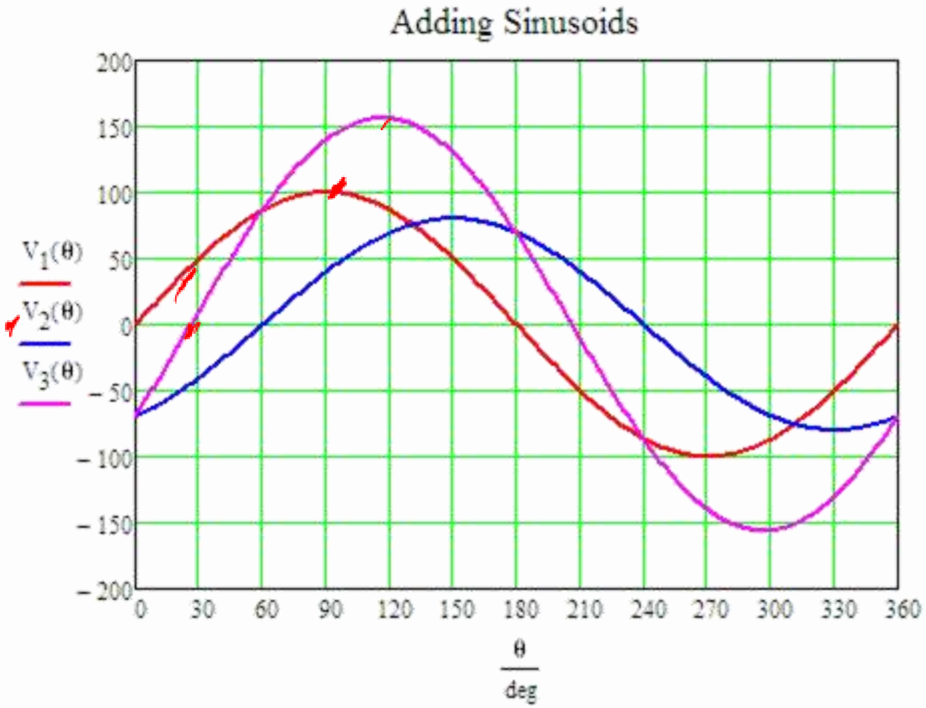
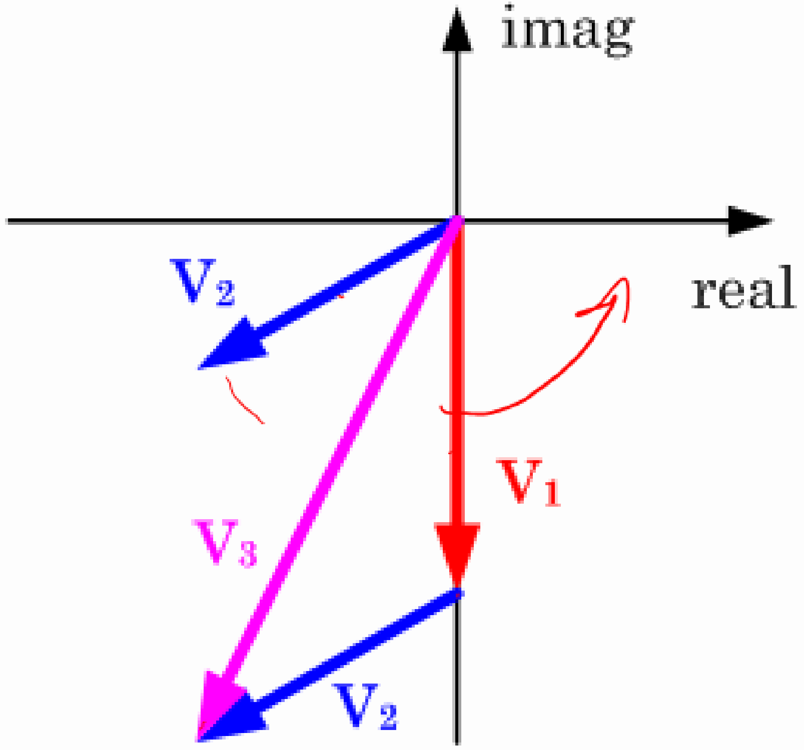
Adding Sinusoidal Functions -1 (same frequency)



$$v_1(t) = 100\sin(\omega t) \qquad v_2(t) = 80\sin(\omega t - 60°) \qquad v_3(t) = v_1(t) + v_2(t)$$

Adding the Phasors



Converting Sinusoids to Phasors

Given a sine function: $f(t) = F_{max} \sin(\omega t + \theta)$

The phasor equivalent is: $F(\theta) = F_{max} \sin(\theta) - jF_{max} \cos(\theta) = F_{max} \angle(\theta - 90°)$

Given a cosine function: $f(t) = F_{max} \cos(\omega t + \theta)$

The phasor equivalent is: $F(\theta) = F_{max} \cos(\theta) + jF_{max} \sin(\theta) = F_{max} \angle(\theta)$

Adding Sinusoidal Functions -2 (same frequency)

Easiest numerical procedure is to convert the sinusoids to phasors:

$$v_1(t) = 100\sin(\omega t) \longrightarrow V_1 = 100\sin(0°) - j100\cos(0°) = -j100$$

$$v_2(t) = 80\sin(\omega t - 60°) \longrightarrow V_2 = 80\sin(-60°) - j80\cos(-60°)$$

$$V_3 = V_1 + V_2 = -69.28 - j140 = 156.2\angle -116.3°$$

$$v_3(t) = 156.2\cos(\omega t - 116.3°)$$

$$v_3(t) = 156.2\sin(\omega t - 116.3° + 90°)$$

$$v_3(t) = 156.2\sin(\omega t - 26.3°)$$