

5.1 #19 CONT.

$$x(0) = 0.5 = C_1$$

note $\sin \phi > 0$

$$x' = -2C_1 \sin 2t + 2C_2 \cos 2t$$

$$x'(0) = \frac{3}{2} = 2C_2$$

$$\frac{3}{4} = C_2$$

$\cos \phi > 0$

ϕ in Quad I

$$x = \frac{1}{2} \cos 2t + \frac{3}{4} \sin 2t$$

$$x = A \sin(\omega t + \phi)$$

$$A = \sqrt{C_1^2 + C_2^2}$$

$$= \sqrt{\frac{1}{4} + \frac{9}{16}}$$

$$= \sqrt{\frac{13}{16}} = \frac{\sqrt{13}}{4}$$

$$\phi = \tan^{-1}\left(\frac{C_1}{C_2}\right) = \frac{\frac{1/2}{3/4}}{1} = \frac{2}{3}$$

$$\phi = .5888$$

$$x = \frac{\sqrt{13}}{4} \sin(2t + .5888)$$