3.11 For each of the following signals, compute the complex exponential Fourier series by using trigonometric identities, and then sketch the amplitude and phase spectra for all values of k.

(a) $x(t) = \cos(5t - \pi/4)$

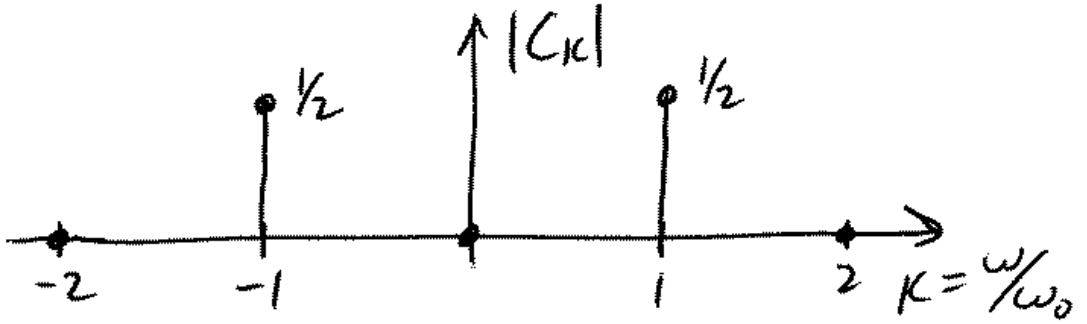
Use $\cos A = \dfrac{e^{+jA} + e^{-jA}}{2}$

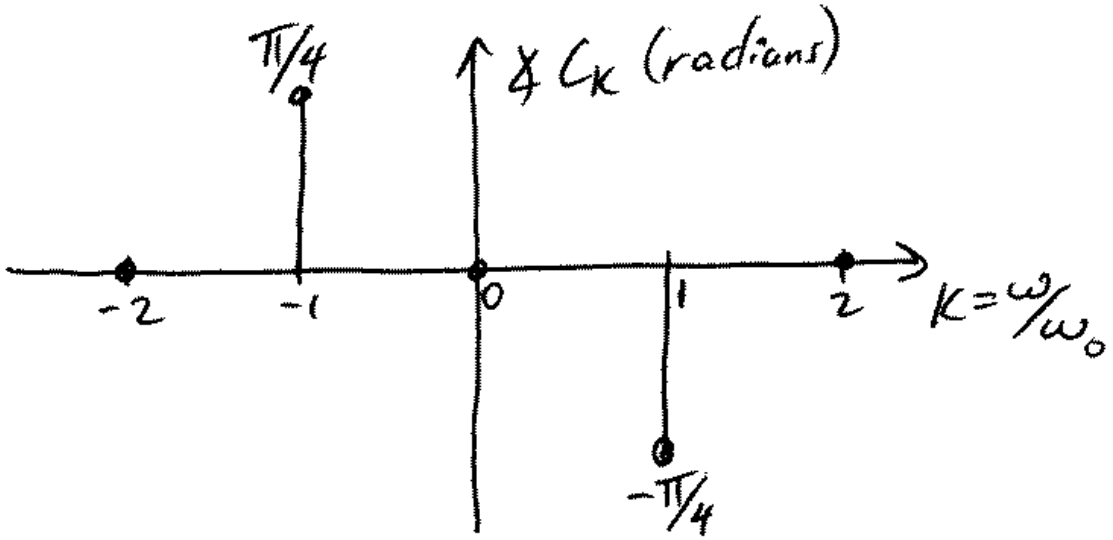
$$x(t) = \tfrac{1}{2} e^{j(5t - \pi/4)} + \tfrac{1}{2} e^{-j(5t - \pi/4)}$$

$$x(t) = \underbrace{\tfrac{1}{2} e^{-j\pi/4} e^{j5t}}_{C_1} + \underbrace{\tfrac{1}{2} e^{+j\pi/4} e^{-j5t}}_{C_{-1}}$$

all other $C_k = 0$

$\omega_0 = 5$ rad/s $\quad T = \dfrac{2\pi}{\omega_0} = \dfrac{2\pi}{5}$ sec





3.11 For each of the following signals, compute the complex exponential Fourier series by using trigonometric identities, and then sketch the amplitude and phase spectra for all values of k.

(c) $x(t) = \cos(t - 1) + \sin(t - 1/2)$

use $\cos A = \frac{e^{jA} + e^{-jA}}{2}$ & $\sin A = \frac{e^{jA} - e^{-jA}}{2j}$

$$x(t) = \frac{e^{j(t-1)} + e^{-j(t-1)}}{2} + \frac{e^{j(t-\frac{1}{2})} - e^{-j(t-\frac{1}{2})}}{2j}$$

$$= \tfrac{1}{2} e^{-j} e^{jt} + \tfrac{1}{2} e^{j} e^{-jt} + \tfrac{-j}{2} e^{-j\frac{1}{2}} e^{jt} + \tfrac{j}{2} e^{j\frac{1}{2}} e^{-jt}$$

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

$$x(t) = (0.860066 \angle -87.972^\circ)\, e^{jt} + (0.860066 \angle +87.972^\circ)\, e^{-jt}$$

C_1 C_{-1}

all other $C_k = 0$