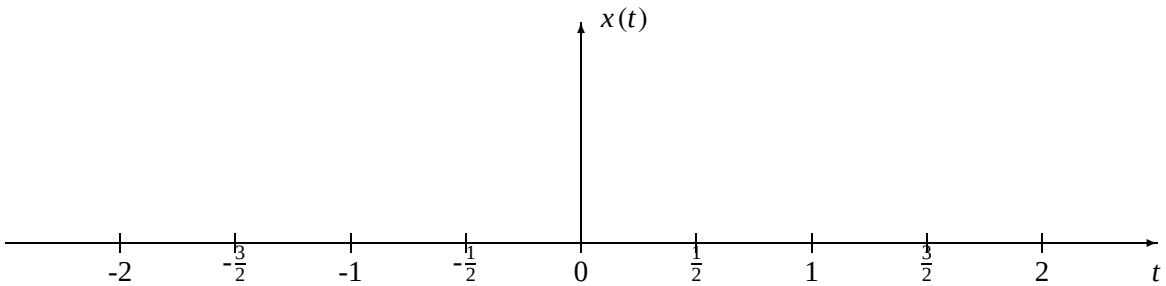
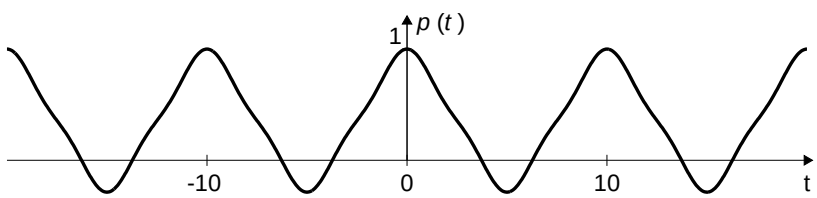
PROBLEM:

(a) Consider the signal $x(t) = \dfrac{20\sin(2\pi t)}{\pi t}$. Make a carefully labeled sketch of $x(t)$ in the space below.



(b) Determine the Fourier transform of $y(t) = x(t-2)$.

(c) Now consider the periodic signal $p(t)$ plotted below:

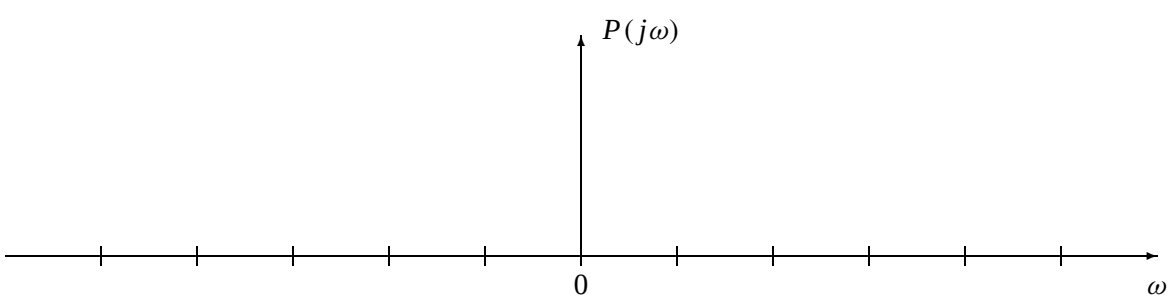


The Fourier series for this input can be simplified to the following form:

$$p(t) = \frac{1}{4} + \frac{4}{\pi^2}\cos(\omega_0 t) + \frac{4}{9\pi^2}\cos(3\omega_0 t)$$

$\omega_0 =$ _____ rad/sec??

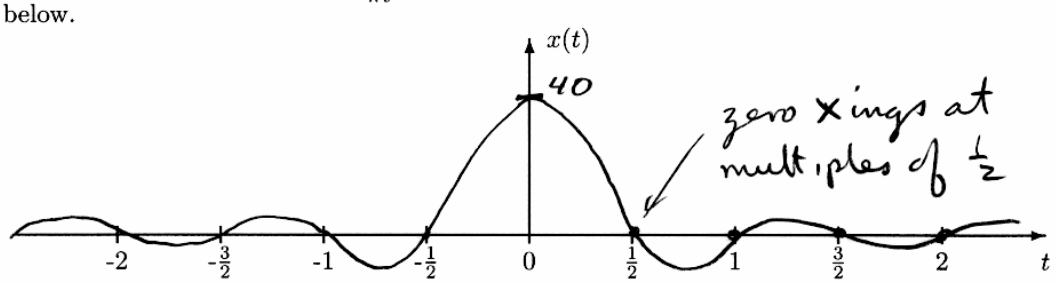
Either write an equation for $P(j\omega)$, the Fourier transform of $p(t)$, in the space below, **or** plot it on the axes below. *You must label your plot carefully to receive full credit.*



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

SOLUTION

(a) Consider the signal $x(t) = \dfrac{20\sin(2\pi t)}{\pi t}$. Make a carefully labeled sketch of $x(t)$ in the space below.

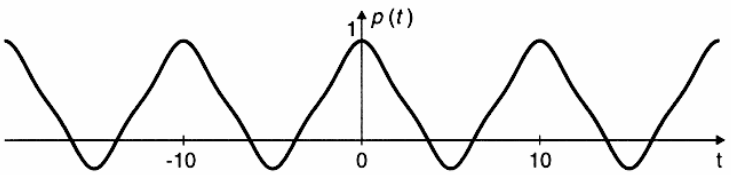


(b) Determine the Fourier transform of $y(t) = x(t-2)$.

$$Y(j\omega) = X(j\omega)e^{-j\omega 2}$$

$$= \begin{cases} 20e^{-j\omega 2} & |\omega| < 2\pi \\ 0 & |\omega| > 2\pi \end{cases}$$

(c) Now consider the periodic signal $p(t)$ plotted below:



The Fourier series for this input can be simplified to the following form:

$$p(t) = \frac{1}{4} + \frac{4}{\pi^2}\cos(\omega_0 t) + \frac{4}{9\pi^2}\cos(3\omega_0 t)$$

$\omega_0 = 2\pi/10 = \pi/5$ rad/sec??

Either write an equation for $P(j\omega)$, the Fourier transform of $p(t)$, in the space below, **or** plot it on the axes below. *You must label your plot carefully to receive full credit.*

$$P(j\omega) = \frac{\pi}{2}\delta(\omega) + \frac{4}{\pi}\delta(\omega-\omega_0) + \frac{4}{\pi}\delta(\omega+\omega_0) + \frac{4}{9\pi}\delta(\omega-3\omega_0) + \frac{4}{9\pi}\delta(\omega+3\omega_0)$$