

### Periodic Signals:

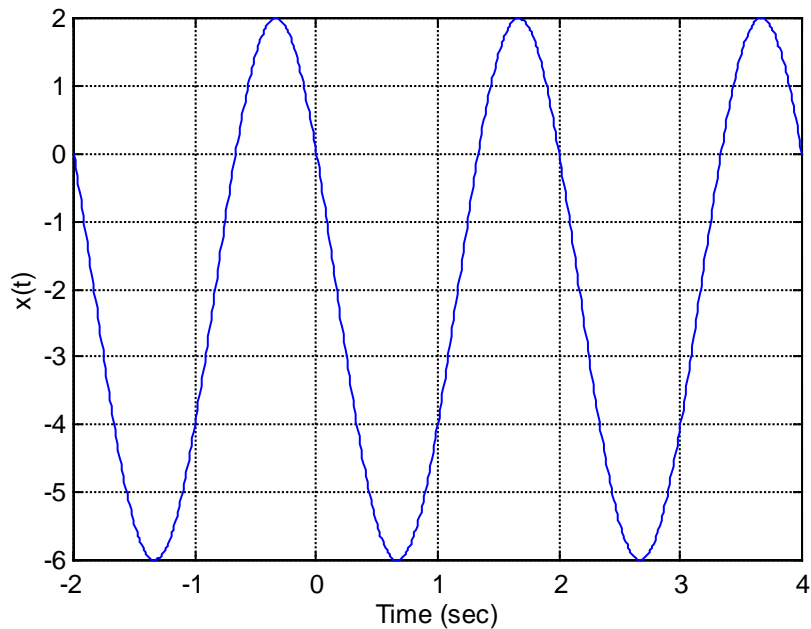
1. For the following signals, (i) determine analytically which are periodic (if periodic, give the period) and (ii) sketch the signals. (Scale your time axis so that a sufficient amount of the signal is being plotted.).

- a)  $x(t) = 4 \cos(5\pi t)$
- b)  $x(t) = 4 \cos(5\pi t - \pi/4)$
- c)  $x(t) = 4u(t) + 2\sin(3t)$
- d)  $x(t) = u(t) - 1/2$
- e)  $x[n] = 4 \cos(\pi n)$
- f)  $x[n] = 4\cos(\pi n - 2)$
- g)  $x[n] = 2\sin(3n)$
- h)  $x[n] = u[n] + p_4[n]$

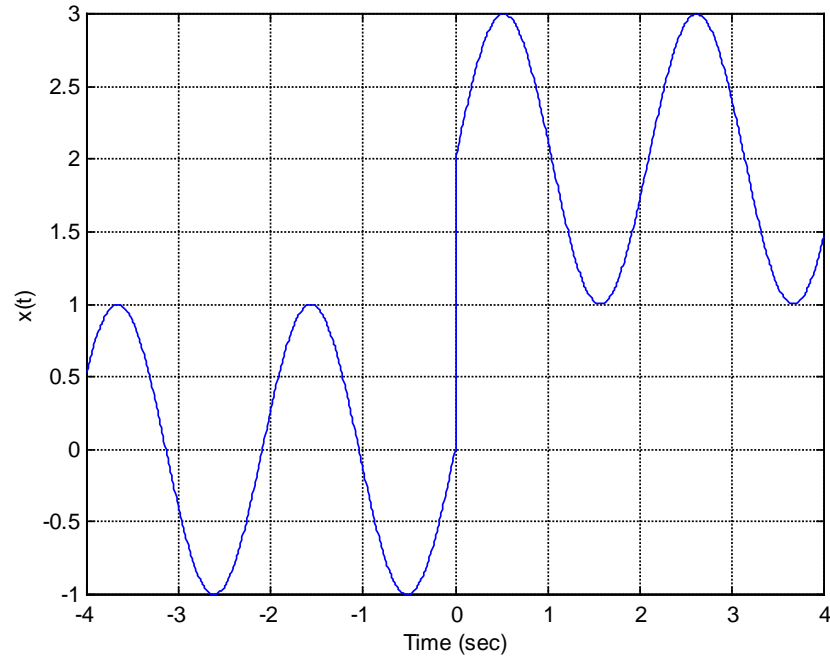
2. Determine if the following signals are periodic; if periodic, give the period.

- a)  $x(t) = \cos(4t) + 2\sin(8t)$
- b)  $x(t) = 3\cos(4t) + \sin(\pi t)$
- c)  $x(t) = \cos(3\pi t) + 2\cos(4\pi t)$

3. Give an expression for the signal:



4.



a) Give an expression for  $x(t)$ .

b) Plot  $dx/dt$ .

5. Are the following periodic? If so, give the period.

a)  $x(t) = 4\cos(3\pi t + \pi/4) + u(t)$

b)  $x[n] = 4\cos(0.5\pi n + \pi/4)$

c)  $x(t) = 4\cos(3\pi t + \pi/4) + 2\cos(4\pi t)$

d)  $x[n] = 12\cos(20n)$

e)  $x(t) = \cos(2\omega_1 t) + \cos(3\omega_1 t)$  where  $\omega_1$  is a specific frequency

f)  $x(t) = 4\cos(3\pi t + \pi/2) + 2\cos(8\pi t + \pi/2)$

g)  $x(t) = 2\cos(3\pi t + \pi/2) + 4\cos(10t - \pi/2)$

h)  $x[n] = 10\cos(2\pi(8)n)$

i)  $x[n] = 10\cos(8n)$