Cairo University
Faculty of Engineering
Electronics & Communication Department.

Communication
3rd year 2012 – 2013

Sheet 1

1-Determine the power value for each of the following signals:

(a) $10\cos\left(100t+\frac{\pi}{3}\right)$

(b) $10\cos\left(100t+\frac{\pi}{3}\right)+16\sin\left(150t+\frac{\pi}{5}\right)$

(c) $(10+2\sin 3t)\cos 10t$

(d) $10\cos 5t\cos 10t$

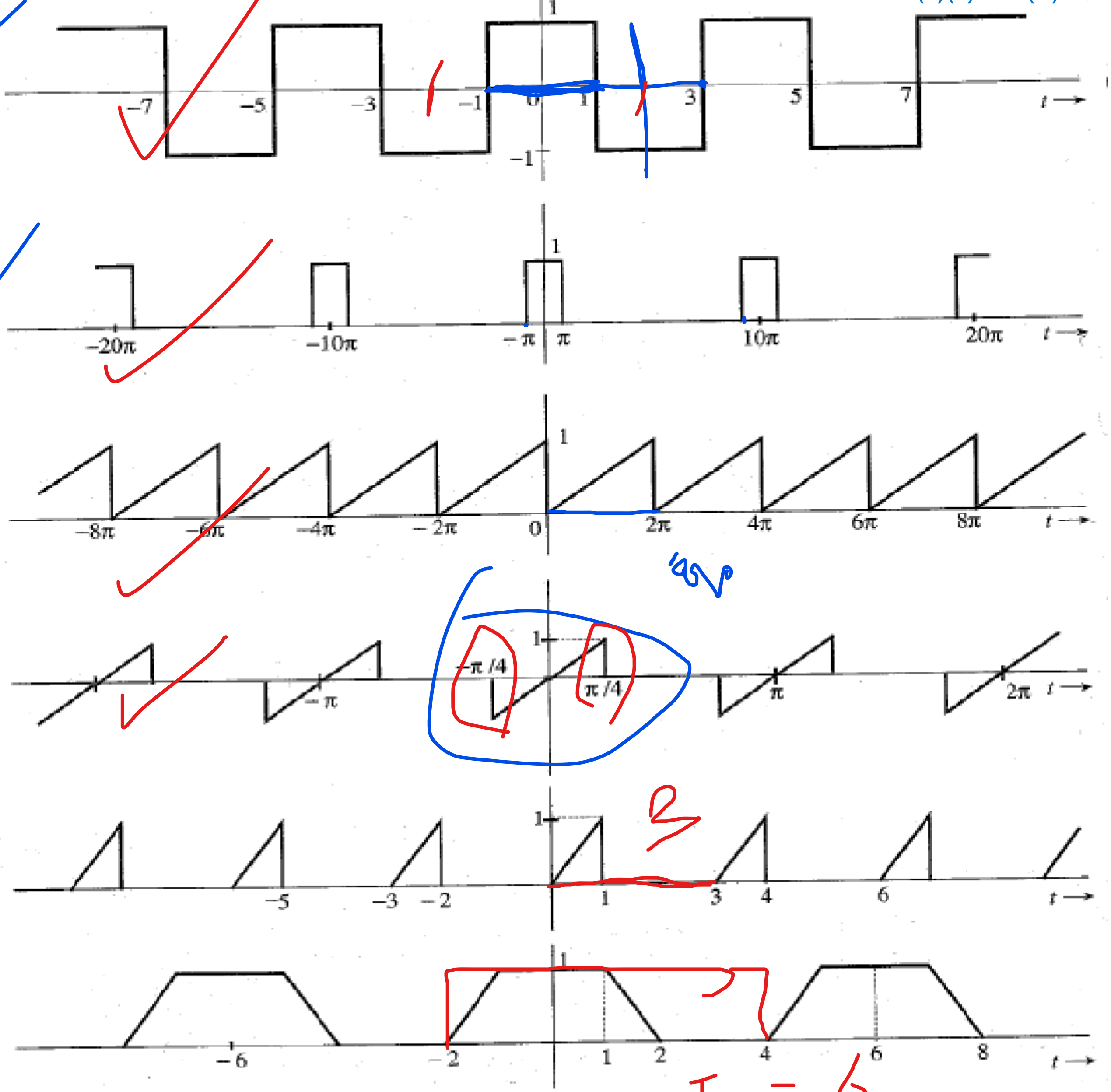
(e) $10\sin 5t\cos 10t$

(f) $e^{j\alpha t}\cos\omega_0 t$

2-For each of the shown periodic signals, find exponential Fourier series and sketch the corresponding spectra.

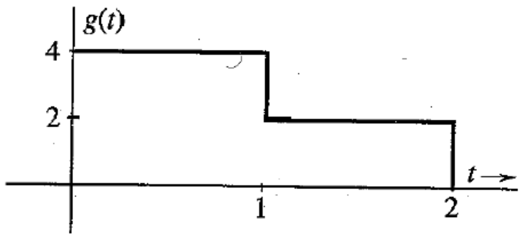
(1)rect(t/2) - (1)rect(t/2 - 2)

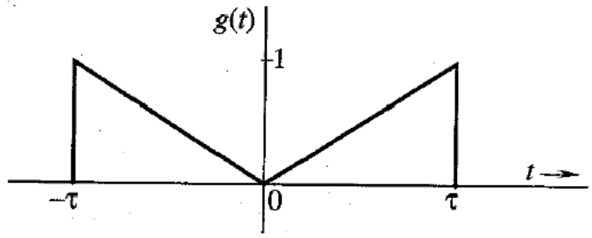
ft = (1)(2) sinc(w) - (1)(2) sinc(w) * e^(-jwot))



$T_0 = 6$

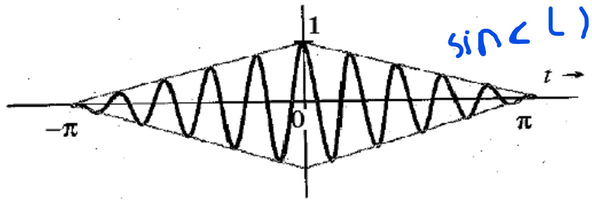
3- Find the Fourier transform of the signals shown:

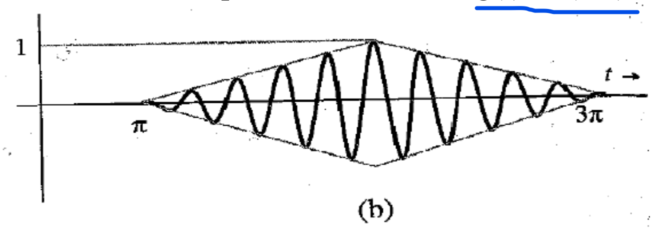




4- Find Fourier transform of the shown signals using the appropriate properties of the Fourier transform. Sketch the amplitude and phase Spectra. *Hint:* These functions can be expressed in the form g(t)cos(ω_ot)

sinc( )

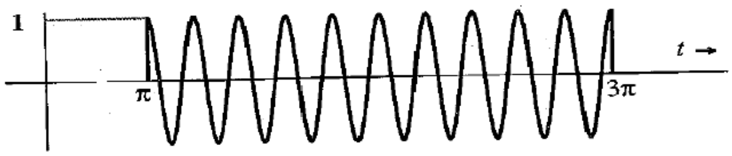




(b)

(a)

cos



(c)

5-Signals $g_1(t)=10^4\ \mathrm{rect}(10^4 t)$ and $g_2(t)=\delta(t)$ are applied at the inputs of the ideal low-pass filter $H_1(\omega)=\mathrm{rect}(\omega/40000\pi)$ and $H_2(\omega)=\mathrm{rect}(\omega/20000\pi)$ as shown. The output $y_1(t)$ and y2(t) of these filters are multiplied to obtain the signal $y(t)=y_1(t)y_2(t)$

a) Sketch $G_1(\omega)$ and $G_2(\omega)$.
b) Sketch $H_1(\omega)$ and $H_2(\omega)$.
c) Sketch $Y_1(\omega)$ and $Y_2(\omega)$.
d) Find the bandwidths of $y_1(t)$,$y_2(t)$ and $y(t)$.