ROSE-HULMAN INSTITUTE OF TECHNOLOGY
Department of Electrical and Computer Engineering

EC 300 Signals and Systems — Fall 2000

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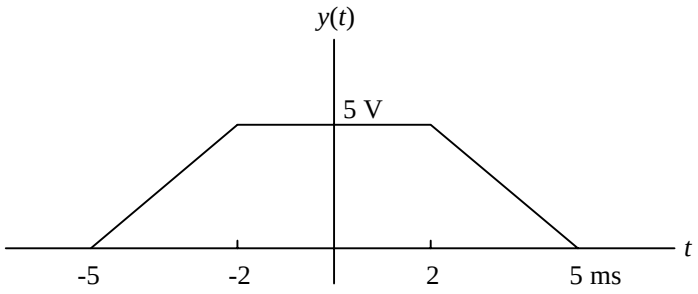
Problem Set 9

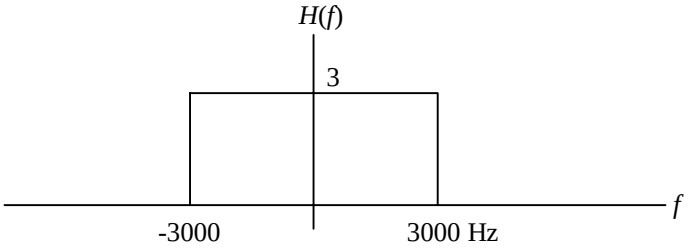
1. Find the Fourier transform $Y(f)$ of the signal $y(t)$ shown below. Use the integration property. Do not forget the $(1/2)G(0)\delta(f)$ term.



2. A filter is characterized by the frequency response $H(f)$ shown below. An input signal

$$x(t) = 3\cos(2\pi 2000t) + 4\sin(2\pi 2000t) \text{ V}$$

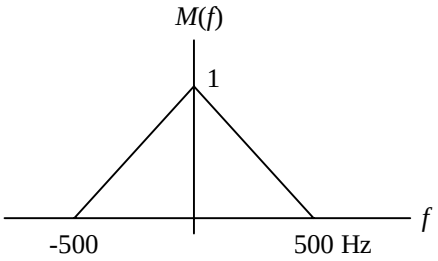
has been present at the filter input for a long time.

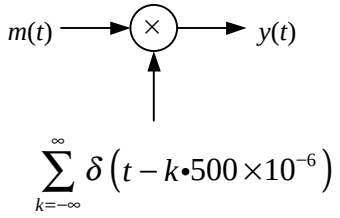


   A. Find and plot the magnitude spectrum $|Y(f)|$ of the filter output $y(t)$.

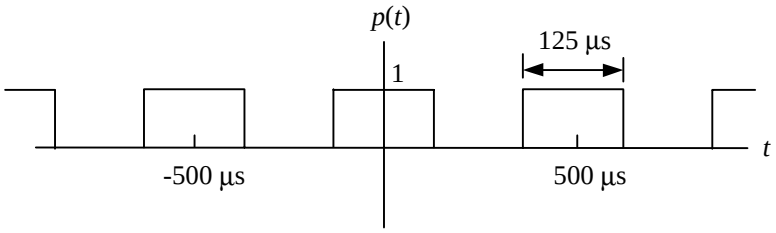
   B. Find and plot the angle spectrum $\angle Y(f)$ of the filter output $y(t)$.

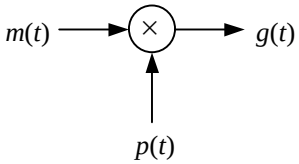
3. Suppose that a signal $m(t)$ has spectrum $M(f)$ shown below. Suppose $m(t)$ is multiplied by the impulse train shown. Find and sketch the spectrum $Y(f)$ of the output $y(t)$.





4. Suppose that the signal $m(t)$ from the previous problem is multiplied by the pulse train $p(t)$ shown. Find and plot the spectrum $G(f)$ of the output $g(t) = m(t)p(t)$.





This problem set is not to be handed in.