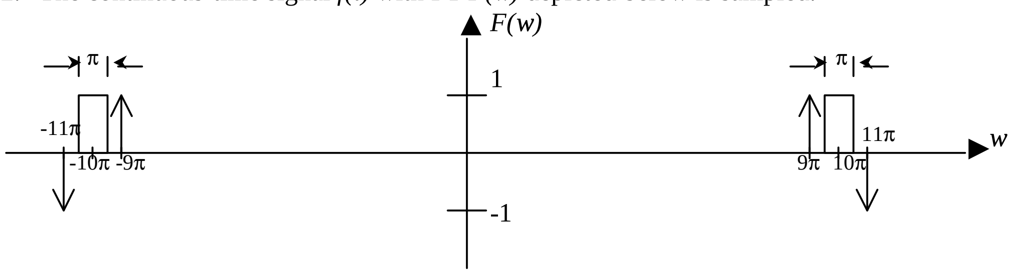
EE342 PS7 DUE: M 03/20/2000

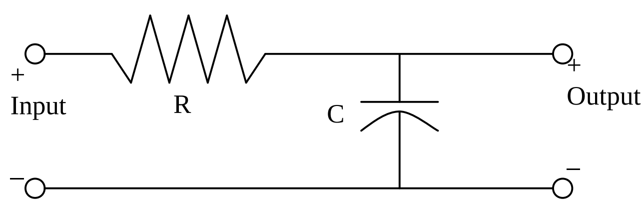
1. Consider sampling the continuous-time signal *f(t) = sinc(pt)*.
   a. Determine the Nyquist (minimum) sampling rate for *f(t)* in Hertz and rad/sec.
   b. Sketch the FT `*F(w)* of the resulting ideally (impulse) sampled signal $\bar{f}(t)$ for the following sampling intervals:
      i. T = 1/4 sec
      ii. T = 1/2 sec
      iii. T = 1 sec
      iv. T = 4/3 sec
   c. Sketch the DTFT *F(W)* of the resulting practically sampled signal *f[k]* for the sampling intervals given in (b). Identify in each case if aliasing occurs.

2. The continuous-time signal *f(t)* with FT *F(w)* depicted below is sampled.



   a. Determine the Nyquist (minimum) sampling rate for *f(t)* in Hertz and rad/sec.
   b. Sketch the FT `*F(w)* of the resulting ideally (impulse) sampled signal $\bar{f}(t)$ for the following sampling intervals:
      i. T = 1/15 sec
      ii. T = 2/15 sec
      iii. T = 1/5 sec
   c. Sketch the DTFT *F(W)* of the resulting practically sampled signal *f[k]* for the sampling intervals given in (b). Identify in each case if aliasing occurs.

3. A continuous-time signal that lies in the frequency band $|\omega| < 5\pi$ rad/sec is contaminated by a large sinusoid of frequency 120π rad/sec. The contaminated signal is sampled at a sampling frequency of $\omega_s = 13\pi$ rad/sec.
   a. After sampling, at what frequency would the interfering sinusoid appear. Give the resulting frequency as both a CT frequency in rad/sec and a DT frequency in rad.
   b. The contaminated continuos-time signal is passed through an antialiasing filter consisting of the RC circuit shown. Find the value of the product RC required so that the interfering sinusoid is attenuated by a factor of 1000 prior to sampling.



   c. Use matlab to plot the magnitude and phase response (spectra) of the antialiasing filter for the RC value determined in part (b).