```matlab
%!----------------------------------------------------------------------
%! DSP HW4 #5
%!  - Generate a pulsed sine wave with f=10kHz and pulse width of .5ms
%!      starting at 0 and ending at T-stop
%!  - Sample the analog signal with Ts=.01ms
%!  - Compute and display the magnitude of the DTFT
%!----------------------------------------------------------------------

%! Enviorment
t_stop = [.001, .005];
f = 10000;
pulse_width = .0005;

for i=1:length(t_stop)
    t = 0:.000001:t_stop(i); % Analog sample times
    sample_rate = .00001/.000001;
    n = t(1:int32(sample_rate):end);
    w = linspace(0, pi, length(n));

    % Signal
    xt = sin(2*pi*f*t) .* ((t - pulse_width) <= 0);
    xn = sin(2*pi*f*n) .* ((n - pulse_width) <= 0);

    % Plot time domain signals
    figure((i-1)*2+1)
    subplot(2,1,1)
    plot(t, xt)
    xlabel('Time (ms)')
    ylabel('Amplitude')
    title('Analog Signal')
    subplot(2,1,2)
    stem(n, xn)
    xlabel('Time (ms)')
    ylabel('Amplitude')
    title('Sampled Signal')

    % Take DTFT
    n = n * 100000;
    xf = dtft(xn, n, w);
    figure((i-1)*2+2)
    plot(w, abs(xf))
    xlabel('w')
    ylabel('|X(w)|')
    title('Magnitude of X(w)')
end

disp(['The major frequency component is at w = .628319 rad/sample which ' ...
    'translates to F = 10kHz with f = F/Fs and Fs = 100000kHz. It looks like
 there is ' ...
    'a minor peak about every 2000Hz which most likely comes from the
 step' ...
```
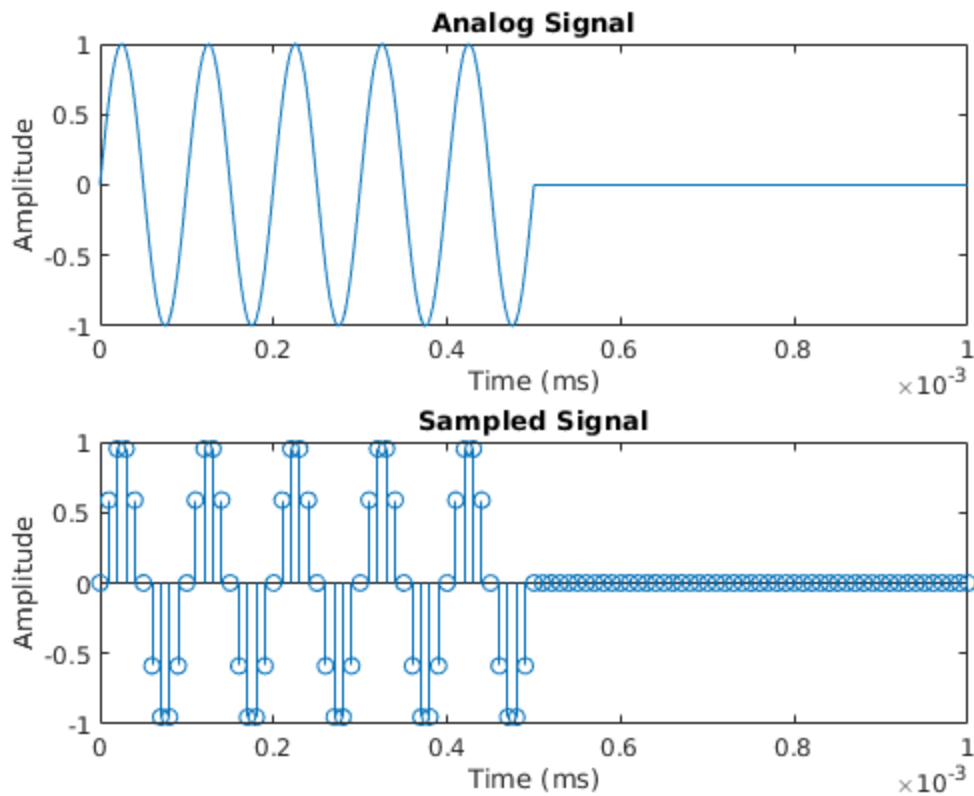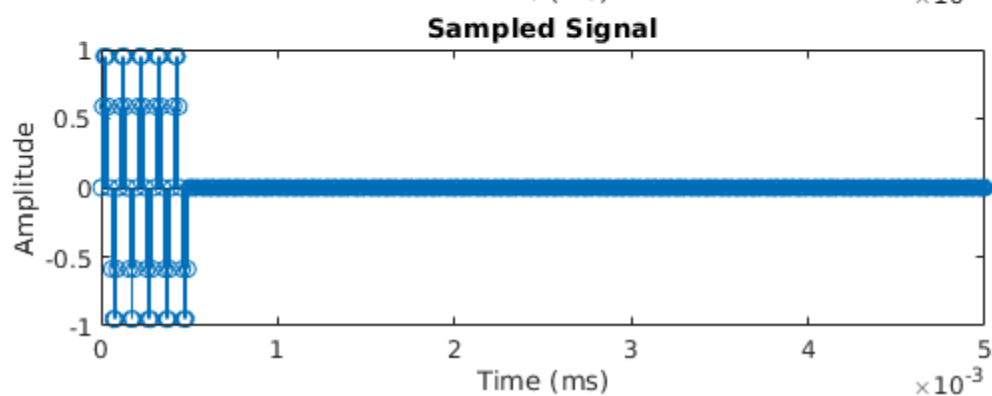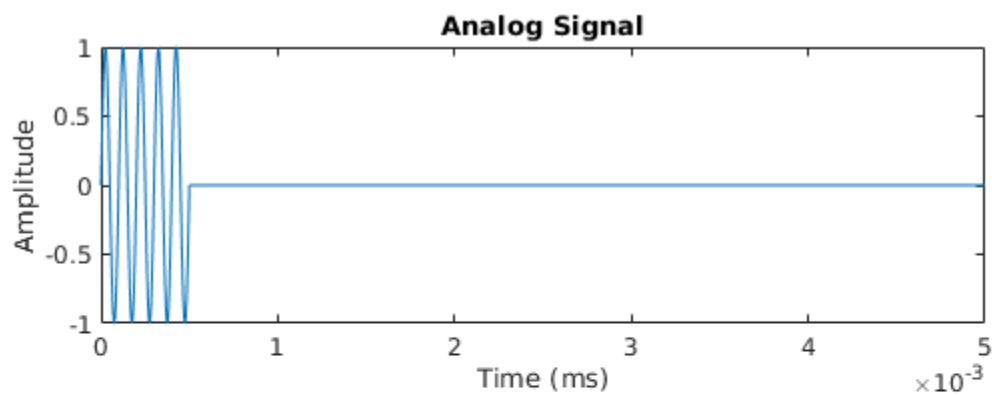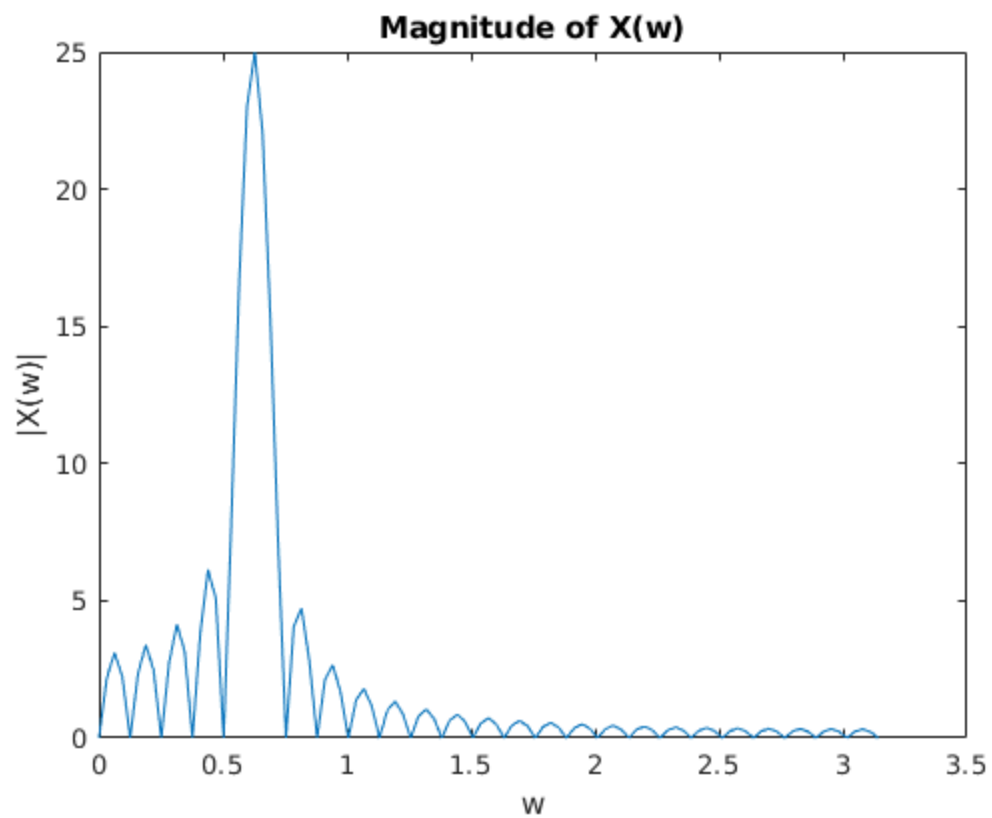
The major frequency component is at w = .628319 rad/sample which translates to
 F = 10kHz with f = F/Fs and Fs = 100000kHz. It looks like there is a minor
 peak about every 2000Hz which most likely comes from the stepfunction. The
 DTFT of the signals look pretty much the same as eachother.

Magnitude of X(w)

Analog Signal

Sampled Signal

Magnitude of X(w)