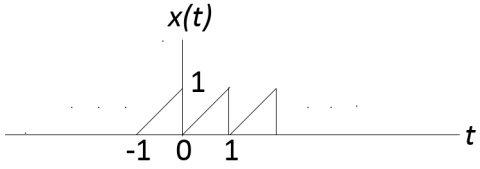
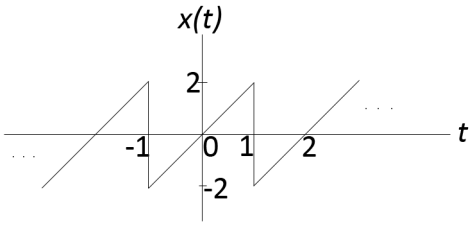
Signals & Systems
Tutorial 3: Fourier Analysis

1. Determine the Fourier series expansion of the periodic signal $x(t) = A\sin(wt) + B\cos(wt)$.

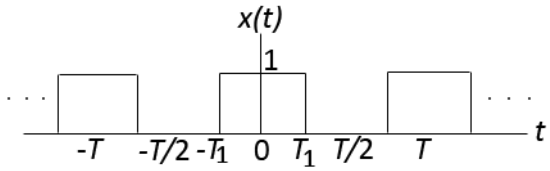
2. The following figure shows the periodic saw-tooth waveform. Find the exponential Fourier series for this waveform. Also, plot the magnitude and phase spectrum of the signal.



3. The following figure shows the periodic saw-tooth waveform. Find the Fourier series for this waveform. Also, plot the magnitude and phase spectrum of the signal.

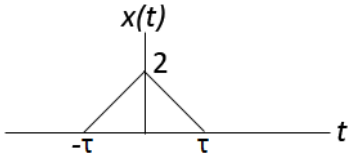


4. For the periodic rectangular wave, sketched as below, plot the magnitude and phase spectra of the signal for $T = 4T_1$.

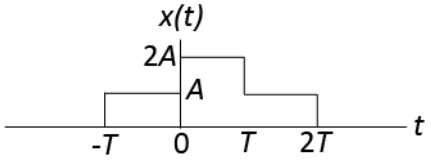


5. Find the Fourier transform of a rectangular pulse of duration 2 seconds and having magnitude of 10 volts, (a) starting from -1 seconds, and (b) starting from origin.

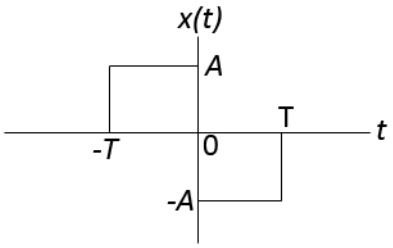
6. Find the Fourier transform of the triangular pulse $x(t)$ as shown below.



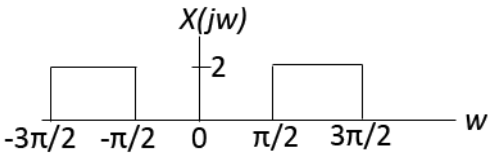
7. Find the Fourier transform of the following signal.



8. Plot the magnitude and phase spetrum of the following signal.



9. Find the inverse Fourier transform of the following signal.



10. Find the Fourier transform of an impulse function $x(t) = \delta(t)$. Also, plot the spectrum.
11. Find the inverse Fourier transform of $X(jw) = \delta(w)$. Also, plot the signal.
12. Find the inverse Fourier transform of $X(jw) = \delta(w - w_0)$.
13. Find the Fourier transform of $\sin(w_0 t)$. Also, plot the spectrum.
14. Find the Fourier transform of the Signum function. Also, plot the spectrum.

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