

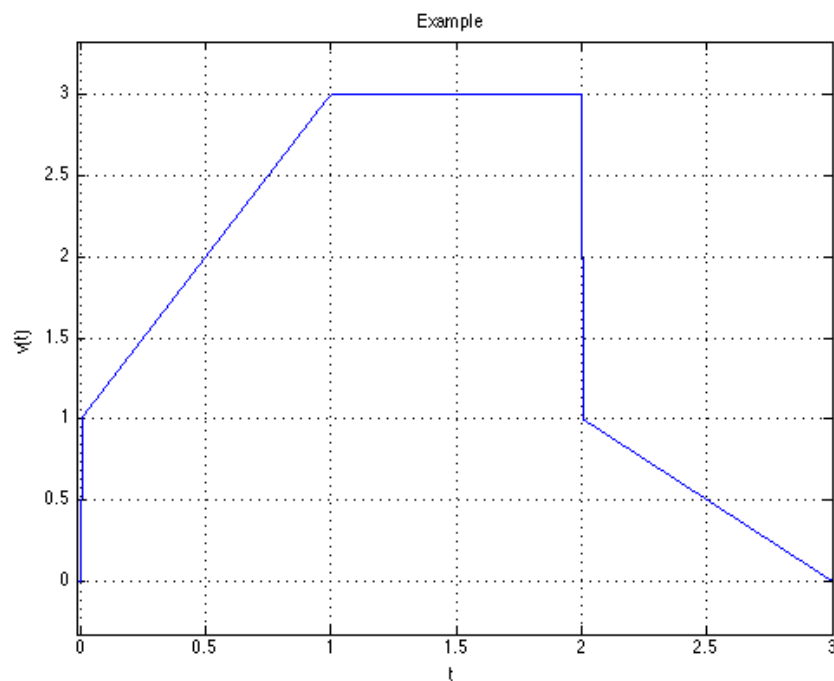
# Homework 1

## Elementary signals

We will distribute this PDF to the *Homework* section of your personal section of the **OneNote Class Notebook** then you can use the *ink feature* (if supported) to hand-write or sketch your answers.

1. Show that the waveform shown below can be represented by the function

$$v(t) = (2t + 1)u_0(t) - 2(t - 1)u_0(t - 1) - tu_0(t - 2) + (t - 3)u_0(t - 3).$$



2. Evaluate each of the following functions:

1.  $\sin t \delta(t - \frac{\pi}{6})$ ;
2.  $\cos 2t \delta(t - \frac{\pi}{4})$ ;
3.  $\cos^2 t \delta(t - \frac{\pi}{2})$ ;
4.  $\tan 2t \delta(t - \frac{\pi}{8})$ ;
5.  $\int_{-\infty}^{+\infty} t^2 e^{-t} \delta(t - 2) dt$ ;
6.  $\sin^2 t \delta'(t - \frac{\pi}{2})$ .

Check your answers with Matlab.

3. Consider the waveform shown below.

1. Express the voltage waveform  $v(t)$  shown below as a sum of unit step functions for the time interval  $0 < t < 7$  s.
2. Use this result to compute the time derivative of  $v(t)$ , and sketch its waveform.

