1. (25 points) Derive the Laplace transforms of the following signals from the basic definition (equation 3.1 of your textbook).

$x_1(t) = \sin(3t)\, u(t)$
$x_2(t) = \cos(3t - 5)\, u(t)$
$x_3(t) = e^{-3t} u(t)$
$x_4(t) = u(t - 3)$
$x_5(t) = \delta(2t - 5)$

2. (25 points) Use Tables 3-1 and 3-2 as appropriate to write down the Laplace transforms of the following signals:
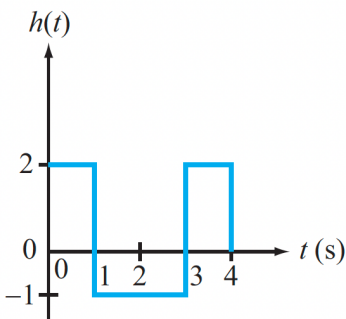
$x_1(t) = \sin(3t)\, u(t)$
$x_2(t) = \cos(3t - 5)\, u(t)$
$x_3(t) = e^{-3t} u(t)$
$x_4(t) = u(t - 3)$
$x_5(t) = \delta(2t - 5)$

3. (25 points) Express the waveform shown in terms of step functions and then determine its Laplace transform.

4. (25 points) Sketch the poles and zeros on the **s**-domain plot (complex plane) for the following function: $\mathbf{H(s)} = \dfrac{(s+3)(s-1)}{(s-2)(s+5)((s+1)^2 + 7)}$

For each pole and zero, examine its location in the s-plane and comment on its contribution to this system's behavior.