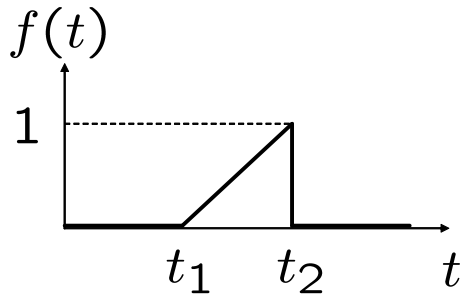
MECH366 Modeling of Mechatronic Systems
Exercises for Laplace Transform
Taken from Appendix B of the Phillips and Parr's textbook.

1. (B.1, B.2) Use the Laplace transform table to obtain the Laplace transform of the following functions.
   (a) $f(t) = u(t - 2.5)$
   (b) $f(t) = e^{-4t}$
   (c) $f(t) = t$
   (d) $f(t) = -3te^{-t}$
   (e) $f(t) = -5\cos t$
   (f) $f(t) = t\sin 3t$
   (g) $f(t) = 7e^{-0.5t}\cos 3t$
   (h) $f(t) = 5\cos(4t + \pi/6)$
   (i) $f(t) = 6e^{-2t}\sin(t - \pi/4)$
2. (B.5.(a)) Find and plot $f(t)$ if its Laplace transform is given by
$$F(s) = \frac{e^{-t_1 s} - e^{-t_2 s}}{s}, \quad t_2 > t_1.$$
3. (B.5.(b)) Find the Laplace transform of the triangular pulse shown below.



4. (B.6) For a function $f(t) = 4e^{-2(t-3)}u(t - 3)$,
   (a) Find $\mathcal{L}\{f'(t)\}$ by differentiating $f(t)$ and then using the Laplace transform table.
   (b) Find $\mathcal{L}\{f'(t)\}$ using the theorem for differentiation.
5. (B.7) For functions $f_1(t) = 5e^{-2(t-1)}$ and $f_2(t) = 5e^{-2(t-1)}u(t - 1)$,
   (a) Sketch the two time functions.
   (b) Find the Laplace transforms.