ENGR 3323: Signals and Systems

HW 5_Ch4

1) By direct integration find the Laplace transform and the region of the convergence of the following functions:

a) $u(t) - u(t\text{-}1)$ b) $te^{-t}u(t)$ c) $e^{-2t}u(t - 5) + \delta(t\text{-}1)$

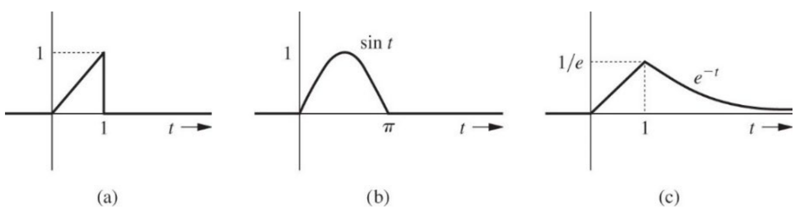
2) Find the inverse (unilateral) Laplace transform of the following functions:

a. $\dfrac{2s+5}{s^2+5s+6}$ b. $\dfrac{3s+5}{s^2+4s+13}$ c. $\dfrac{s+2}{s(s+1)^2}$ d. $\dfrac{(s+1)^2}{s^2-s-6}$

3) Suppose a CT signal $x(t) = 2[u(t\text{-}2) - u(t\text{+}1)]$ has a transform $X(s)$.

a) If $Y_a(s) = e^{-5s}sX(s+1/2)$, determine and sketch the corresponding signal $y_a(t)$.
b) If $Y_b(s) = 2^{-s}sX(s\text{-}2)$, determine and sketch the corresponding signal $y_b(t)$.

4) Using only the Laplace table and the time-shifting property, determine the Laplace transform of the signals shown below. [Hint: See textbook for discussion of expressing such signals analytically.]



5) It is difficult to compute the Laplace transform $X(s)$ of signal $x(t) = (1/t)u(t)$ by using direct integration. Instead, properties provide a simpler method.

a. Use Laplace transform properties to express the Laplace transform of $tx(t)$ in terms of the unknown quantity $X(s)$.
b. Use the definition to determine the Laplace transform of $y(t) = tx(t)$.
c. Solve for $X(s)$ by using the two pieces from a and b. Simplify your answer.