Unit 3 Lesson 9

- To solve DEs via Laplace, we follow the following steps:
  - Substitute $x^{(n)}$ for $(s^nX = \mathcal{L}(\quad) + \quad x^{(n-1)}(0^-)$ for $n > 0$, else X.
  - Solve for X
  - Refer to Laplace table to work from X to x, after simplifying.

Example Problem

Consider the DE

$$\dot{x} + 3x = e^{-t}; \text{ with rest conditions.}$$

Then, we have $x(0^-) = 0$ and

$$sX + 3X = \frac{1}{s+1}$$

$$X = \frac{1}{(s+1)(s+3)} = \frac{A}{(s+1)} + \frac{B}{(s+3)}$$

$$= \frac{-1/2}{(s+1)} + \frac{1/2}{(s+3)}$$

and thus

$$x = \frac{1}{2}e^{-3t} - \frac{1}{2}e^{-t}$$