Math 3280 Assignment 11, due Thursday, April 13th.
This assignment covers material from chapter 10.

(1) Compute the Laplace transform of the function

$$v(t) = \begin{cases} 1 \text{ for } t \in [0,1] \\ 0 \text{ for } t \in [-\infty, 0) \text{ and } t \in (1, \infty] \end{cases}$$

directly from the definition $\mathcal{L}(v) = \int_0^\infty e^{-st} v(t) dt$.

(2) Use the Laplace transform method to solve the initial value problem $x'' - x' - 2x = 0$, $x(0) = 0$, $x'(0) = 1$.

(3) Use the Laplace transform method to solve the initial value problem $x' = 2x - y$, $y' = 3x + 4$, $x(0) = 0$, $y(0) = 1$.

(4) Use the convolution property of the Laplace transform ($\mathcal{L}(f * g) = F(s)G(s)$) to compute the inverse transform of $H = \frac{1}{(s^2+4)^2}$.

(5) Compute the Laplace transform of the sawtooth function $f(t) = t - \lfloor t \rfloor$ where $\lfloor t \rfloor$ is the *floor* function. The floor of t is the largest integer less than or equal to t. For example, $\lfloor 2.6 \rfloor = 2$.