Part II: Laplace-Domain Methods

1. Given the following differential equation

$$y'' + 8y' + 15y = \cos(2\pi t)u(t)$$

with initial condition $y(0^-) = 0$ and $y'(0^-) = 1$, solve for the total response $y(t)$ (in the time domain) **using the Laplace Transform**.

2. Suppose a linear time-invarient system has a transfer function

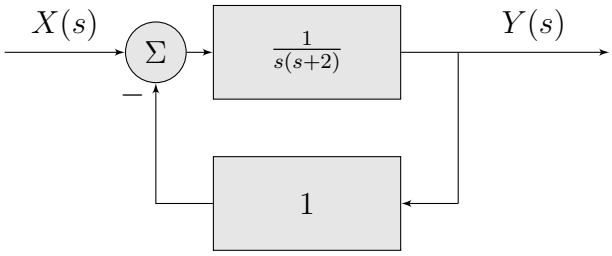
$$H(s) = \frac{1}{s^2 + 8s + 12}$$

(a) Is the system stable or unstable? and in what sense?

(b) What is the zero-state response in the Laplace domain to an input $x(t) = e^{-t}u(t)$.

3. Realize the system from problem 2 using a parallel form, if possible.

4. What is the overall transfer function of the following system?



5. Suppose a linear time-invarient system has a transfer function

$$H(s) = \frac{6}{s + 3}$$

What is the **steady-state response** due to the input $x(t) = \cos(2t)u(t) + 2\sin(3t)u(t)$.