AERO 422 Homework #2

Instructor: Vedang Deshpande

Due: [TBD] at 12:40p.m.

Fall 2021

(**TBC Points**)

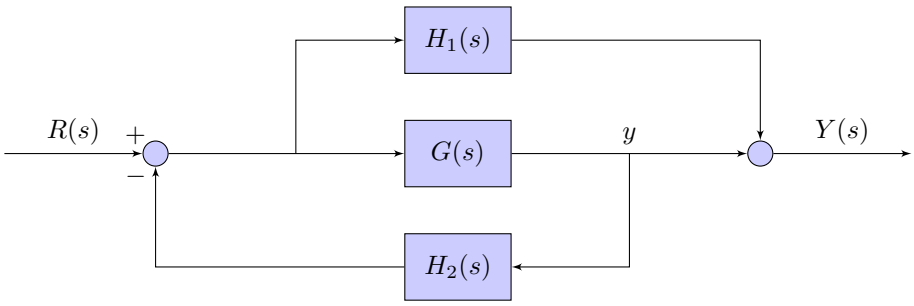
1. Consider the function $f(t) = te^{2t}\sin 3t$
   (a) (**2 points**) Find the Laplace transform using the table. Mention which entries from the table are being used.
   (b) (**1 point**) Can we use the F.V.T. to determine $f(\infty)$? Why or why not?

2. Find the inverse Laplace transform using the table and partial fraction expansion. Show your work.
   (a) (**2 points**)
   $$F(s) = \frac{s+10}{s^2+2s+10}$$
   (b) (**3 points**)
   $$F(s) = \frac{s^2+1}{s(s-1)^3}$$

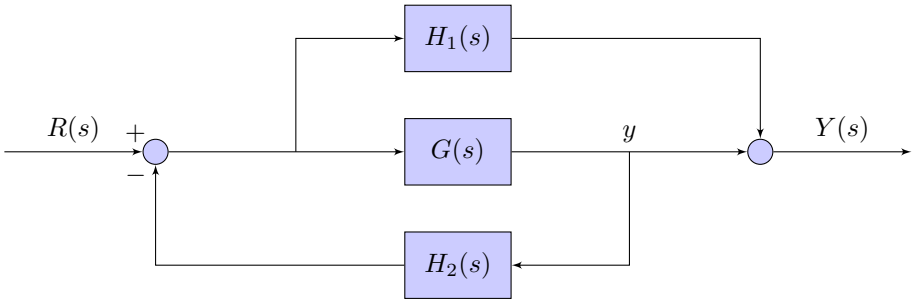
3. A given system is found to have a transfer function that is
   $$\frac{Y(s)}{R(s)} = \frac{10(s+2)}{s^2+8s+15}$$
   (a) (**3 points**) Determine, by hand, $y(t)$ when $r(t)$ is a unit step input. Show your work.
   (b) (**2 points**) Can we use F.V.T. to find $y(\infty)$? If the answer is yes, apply F.V.T. If not, explain why.

4. (a) (**3 points**) Using the convolution integral, find the step response of the system whose impulse response is given below
   $$T(n) = \begin{cases} te^{-t} & t \geq 0 \\ 0 & t < 0 \end{cases}$$
   (b) (**2 points**) Now use the Laplace transform table and partial fraction expansion to find $y(t)$.
   (c) (**2 points**) Apply I.V.T. and F.V.T. (if applicable) to find $y(0)$ and $y(\infty)$.

5. For each of the following block diagrams, reduce the block diagram to find $T(s)$, where $T(s)$ is defined by $Y(s) = T(s)R(s)$.
   (a)



(b)



(c)