Procedure

1. In the space below, derive the transfer function for the circuit in Figure 1 and verify that it is equal to:

\[
H(s) = \frac{V_o(s)}{I_i(s)} = \frac{s + 1/2}{s^2 + 3/2s + 1/2} = \frac{s + 1/2}{(s + 1/2)(s + 1)} = \frac{1}{s + 1}
\]

2. Use the Laplace transform analysis method to show \(v_o(t) = 5e^{-t}u(t) - 5e^{-2t}u(t)\).

3. Perform a transient analysis in LTSpice to verify the output voltage expression in step 2. Simulate out to 4 seconds. Make sure that the “Skip initial operating point solution” is selected under the transient analysis options. Set the parameters of the exponential current source to \(\text{EXP}(5 \ 0 \ 0 \ 0.5 \ 0 \ 1000)\). Plot both the simulated voltage and the expression for the theoretical voltage in the same plot pane. Attach the graph to this sheet before handing it in.

Figure 1