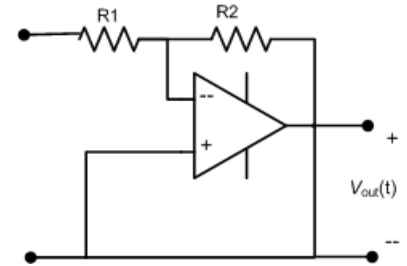


Quiz 2
October 21, 2009

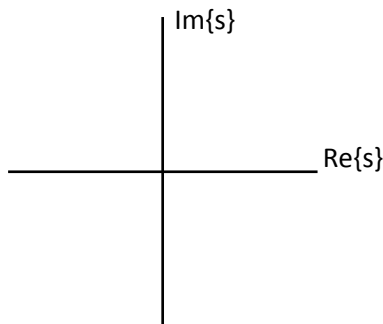
Note: Throughout this quiz, you may leave your answers in terms of R_1 , R_2 , R_x and L , or you may use $R_1 = 4 \Omega$, $R_2 = 10 \Omega$, $R_3 = 6 \Omega$, $L = 2 \text{ H}$. [A table of Laplace transforms was provided on the original quiz but has been omitted from this practice sheet.]

You know from EE 215 that, for an inverting op-amp circuit, $\frac{v_{out}}{v_{in}} = -\frac{R_2}{R_1}$.



a) Show that you can make an integrating circuit by replacing one of the resistors with an inductor. Steps to follow: State which resistor is replaced by the inductor, provide the transfer function for this circuit; write the Laplace transform pair that shows it is an integrator.

b) Mark any poles or zeros on the complex plane, and state whether the integrator is BIBO stable, unstable, or conditionally stable. Use the circuit's response to a unit impulse and its response to a unit step to support your choice.



c) Show that you can insert a resistor R_x in the inductor-integrator circuit to make it more stable. It might not be as good at integrating, but that is OK. Steps to follow: draw the new circuit, provide its transfer function, mark a new pole-zero plot, and state whether it is now BIBO stable or conditionally stable.

