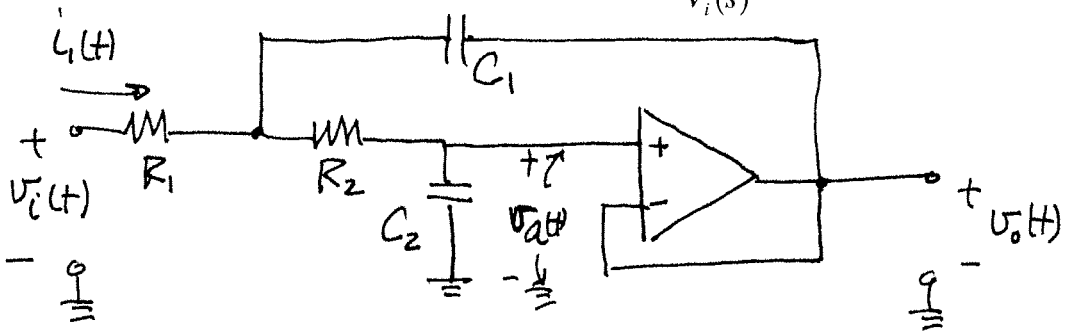
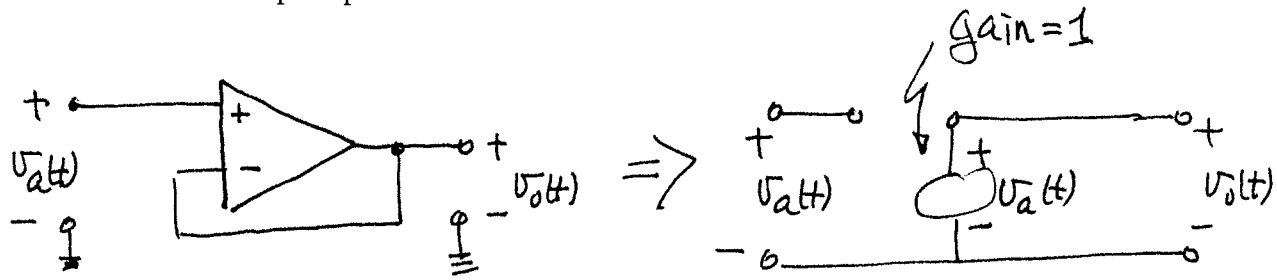
ECSE-2410 Signals & Systems - Spring 2011 Due Tue 4/19/11

1(20). The following active (op-amp) filter (called the Sallen-Key active filter) is used to design second-order filters like Butterworth. Find the transfer function, $\frac{V_0(s)}{V_i(s)}$, in terms of R_1, R_2, C_1 and C_2.



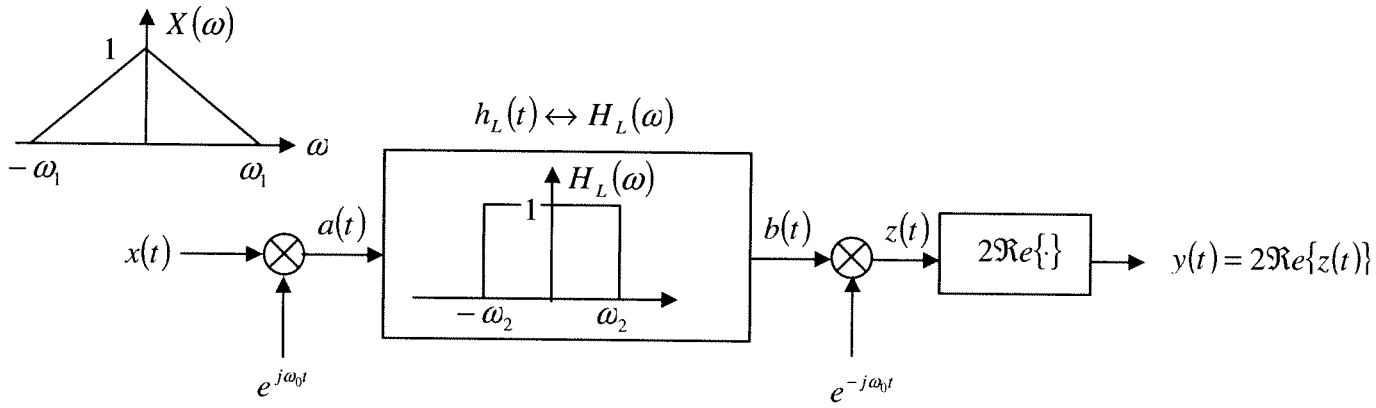
You can think of the ideal op-amp as:



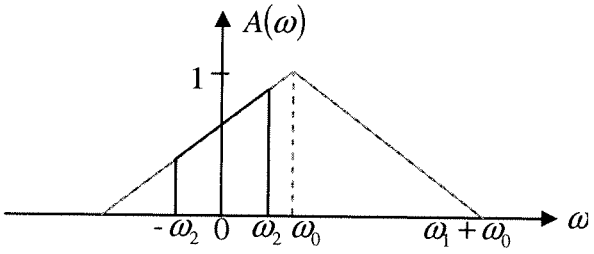
2(30). Show that the system below is basically the bandpass filter:

$$H_{BP}(\omega) = \frac{Y(\omega)}{X(\omega)} = H_L(\omega - \omega_0) + H_L(\omega + \omega_0).$$

Assume that $x(t)$ and $h(t)$ are real. Also, $y(t) = z(t) + z^*(t) \leftrightarrow Y(\omega) = Z(\omega) + Z^*(-\omega)$.



For example,



3(50). The block diagram below represents a chopper stabilized amplifier used to amplify low frequency signals such as those found in transducer outputs. Assume the frequency range of $x(t)$ is given by the Fourier transform $X(\omega)$ shown. Find the overall gain of the amplifier over the frequency range of interest.