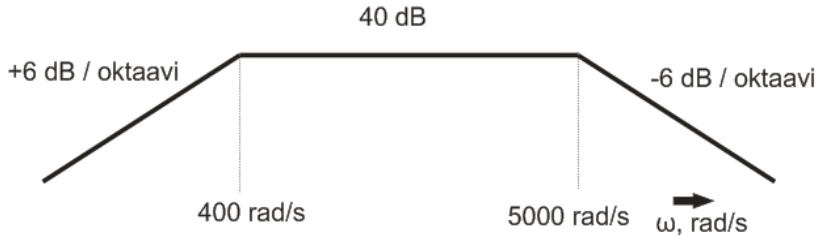
Analog electronics, Fall 2012

Exercise 3, 23.11.2010

1.

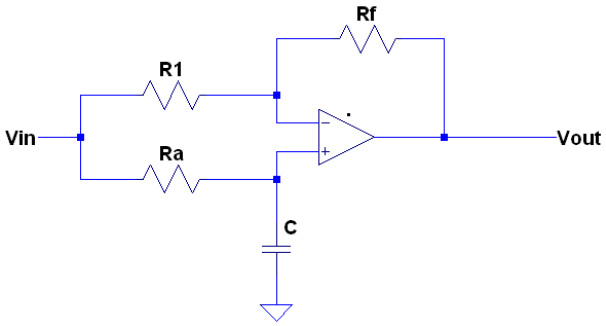
Determine the transfer function corresponding to the asymptotic frequency response depicted below. Design such filter using cascaded 1st order active circuits



2.

Compute the transfer function and frequency response (amplitude and phase) of the circuit depicted below. Give the transfer function in the following form:

$$T(s) = K\frac{s+z_1}{s+p_1}$$



b) What kind of filter is it (low-pass, high-pass etc.)?

3.

Derive the transfer function of the Tow-Thomas circuit for the low-passed voltage, V_L (Schaumann, Eq. 4.27a, Fig. 4.10, page 133). Assume, that the operational amplifiers are ideal.

4.

a) Design a 2nd order low-pass filter, with $Q = 1$ ja $f_0 = 20\ kHz$ using the Sallen-Key circuit. What is the DC gain? Compute the maximum gain and the corresponding frequency.
b) Design a 2nd order high-pass filter using the Åckerberg-Mossberg circuit (Schaumann, Fig. 5.1, page 194), with $f_0 = 50\ kHz$ and high frequency gain of 3 dB. Pick the Q-value so, that the maximum gain is 12 dB. Pick the summer coefficients so, that the circuit works at least up to 300 kHz. Unity-gain bandwidth of the operational amplifier is $\omega_t = 3\ MHz$.