Let

$$v_s = \sum_{k=-1}^{3} V_k \cos\left(10^k \omega_o t + \phi_k\right)$$

Find $v_o(t)$ for the circuits on 23-4 through 23-7 of the lecture notes.

	0	0.01*ω	0.1*ω	ω	10*ω	100*ω	1000*ω
|H(jω)|							
∠H(jω)							

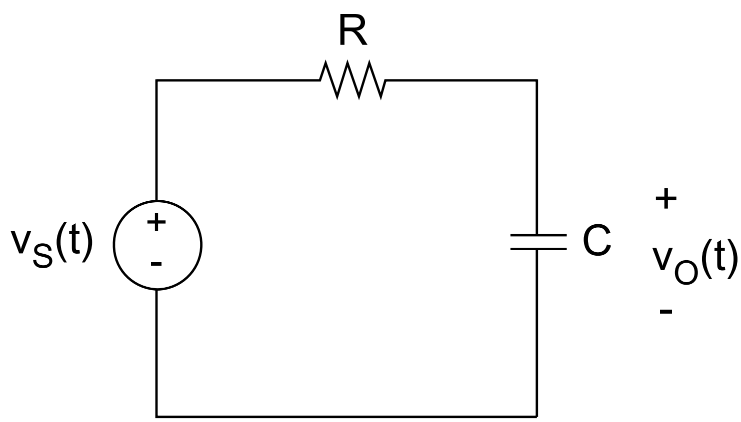
	0	0.01*ω	0.1*ω	ω	10*ω	100*ω	1000*ω
|H(jω)|							
∠H(jω)							

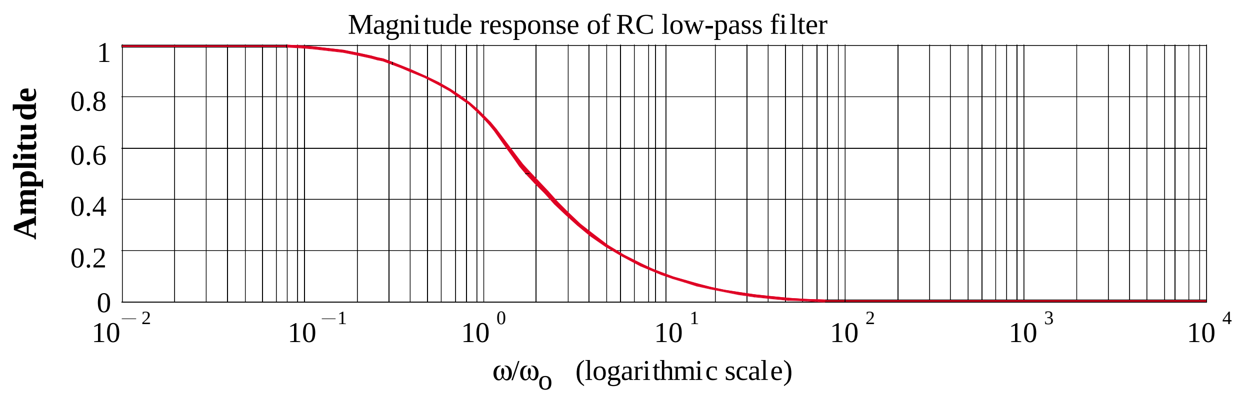
	0	0.01*ω	0.1*ω	ω	10*ω	100*ω	1000*ω
|H(jω)|							
∠H(jω)							

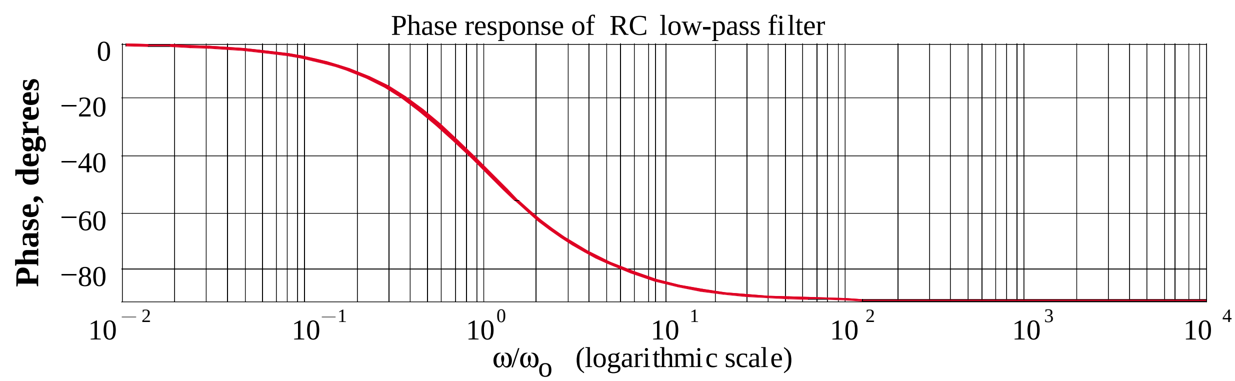
Homework #9, due 5/28/08
12-1, 12-2, 12-3, 12-4, 12-9, 12-10 and the following:

Problem 1:
Suppose we have a noisy signal, where the raw signal is $v_i = V_I \cos 500t$ and the noise can be modeled as $v_n = V_N \cos 50 \cdot 10^6 t$. Use the circuit in slide 23-3 (repeated below) and input $v_s = v_i + v_n$ to "filter" the high frequency noise. Select R and C so as not attenuate v_i below 70% of its original strength, while the noise should be dampened below 1%. What is the resulting output signal in the time domain?

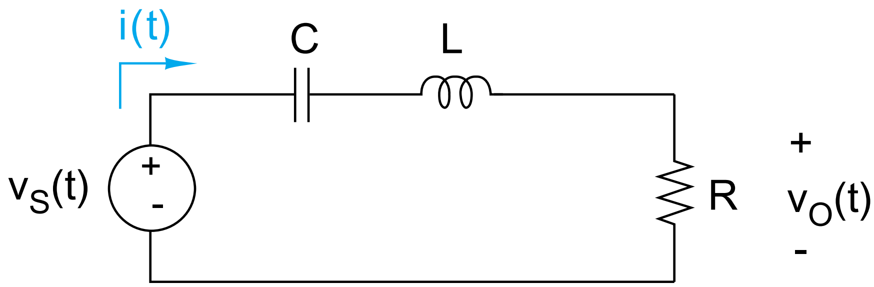
Problem 2:
Using the circuit in slide 23-7 (repeated below), choose R, L and C to design a bandpass filter that selects 90.5 MHz. The band should be as tight as possible, subject to $R \leq 1k\Omega$.

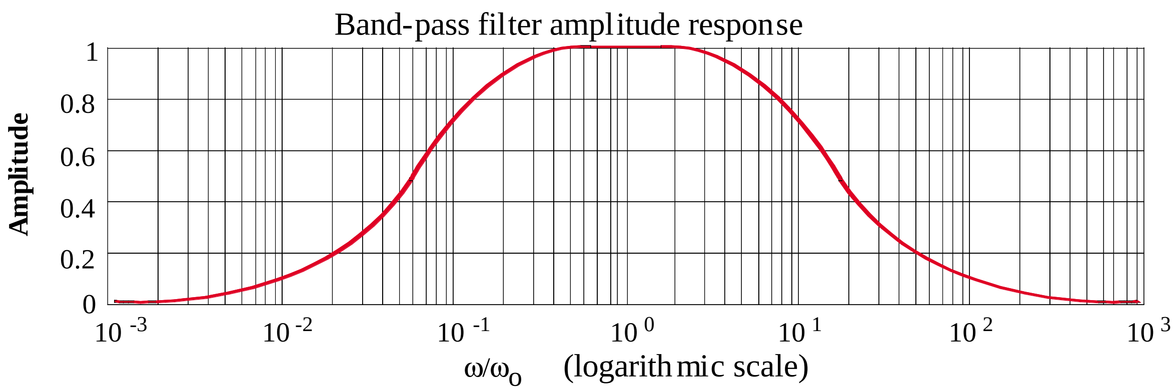


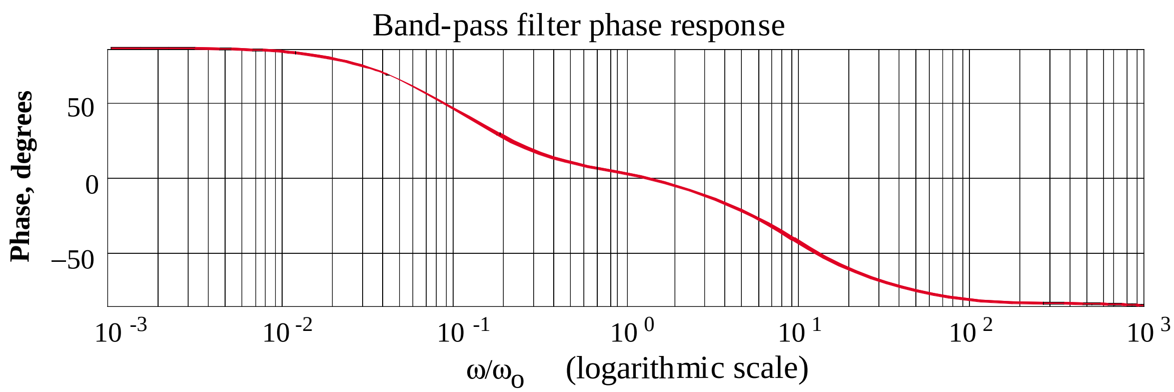




$$\frac{\mathbf{V}_o}{\mathbf{V}_s} = \frac{1}{\sqrt{1+\left(\omega/\omega_o\right)^2}} e^{j\left(-\arctan\left(\omega/\omega_o\right)\right)} \quad ; \quad \omega_o = \frac{1}{CR}$$







$$\frac{\mathbf{V}_o}{\mathbf{V}_s} = \frac{Q\omega/\omega_o}{\sqrt{\left(1-(\omega/\omega_o)^2\right)^2 + (Q\omega/\omega_o)^2}} e^{j\left(90-\arctan\left(\frac{Q\omega/\omega_o}{1-(\omega/\omega_o)^2}\right)\right)};$$

$$\omega_o = \frac{1}{\sqrt{LC}}; \quad Q = \omega_o CR = \frac{R}{\omega_o L}; \quad \text{Bandwidth} = \frac{\omega_o}{Q}$$