Exam Problem: Spring 1999

$$4C\frac{d^2v_o}{dt^2} + 2\times10^{-4}\frac{dv_o}{dt} + 2\times10^{4}v_o = 2\times10^{-4}\frac{dv_s}{dt} + 1\times10^{-2}v_s$$

(a) $$H(s) = \frac{2\times10^{-4}s + 1\times10^{-2}}{4Cs^2 + 2\times10^{-4}s + 2\times10^{5}}$$

(b) poles: $4(50\times10^{-12})s^2 + 2\times10^{-4}s + 2\times10^{5} = 0$

$$s = (-0.5 \pm 9.9875j)\times10^{6}$$

zero: $2\times10^{-4}s + 1\times10^{-2} = 0$, $s = -50$

(c) Input A: $s = 3\times10^{6}j$

Input B: $s = 1\times10^{7}j$ → closer to poles

Hence Input A has smaller output

(d) magnitude: amplification of the input

phase: shift the phase of the input.