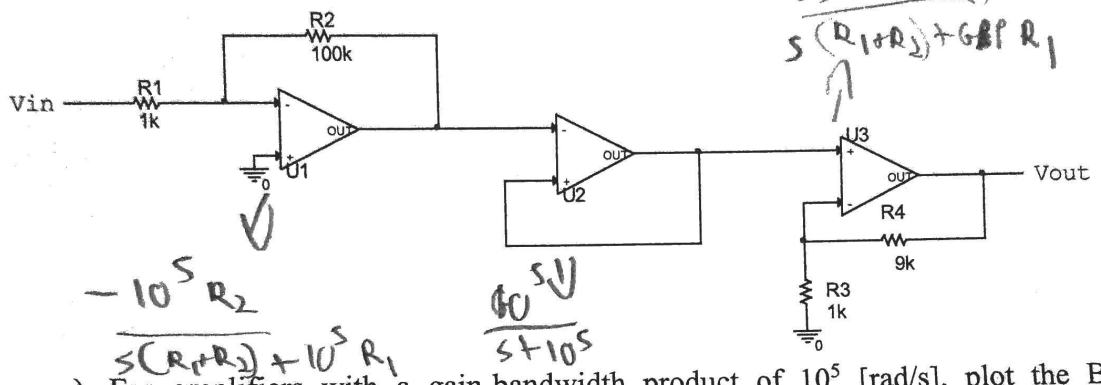
Homework 5

Reading: Chapter 2.5-2.8

1) Gain-Bandwidth Product

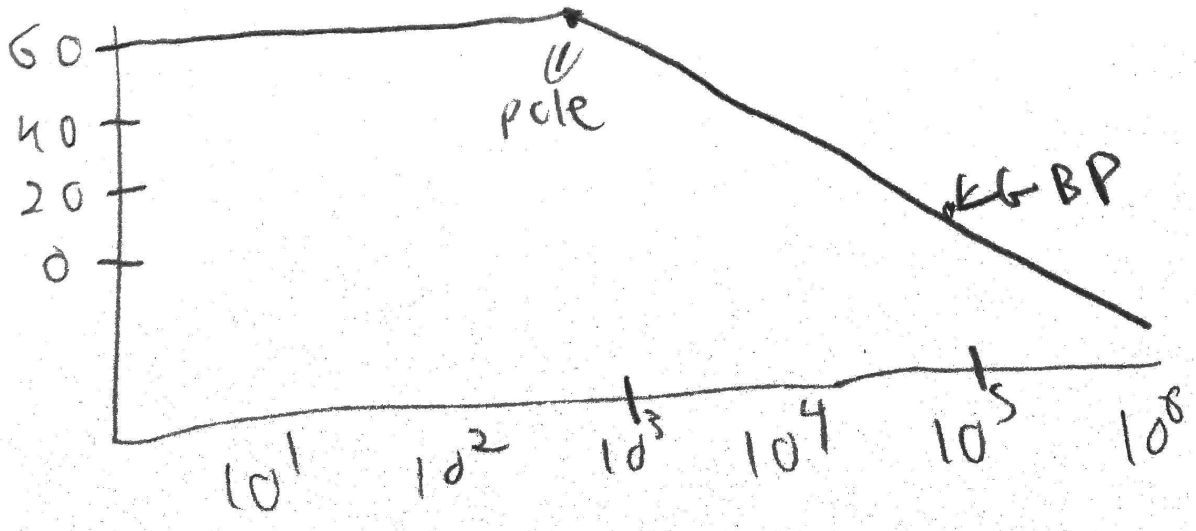


a) For amplifiers with a gain-bandwidth product of 10^5 [rad/s], plot the Bode magnitude for the above circuit. (Be careful, the low pass filter characteristics are associated with the op-amp, not the overall circuit.)

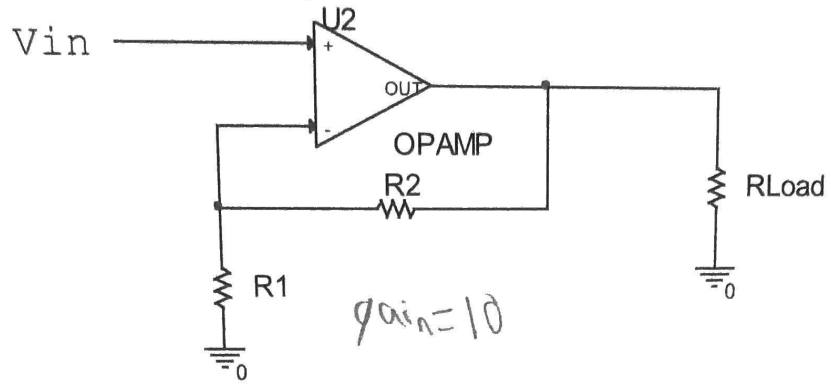
Total $H(s) = \frac{-10^5}{s+10^{-3}} \cdot \frac{10^5}{10^5+s} \cdot \frac{10^5}{s+10^4}$

pole

Bode Plot:



2) Op-amp limiting factors – Voltage Saturation

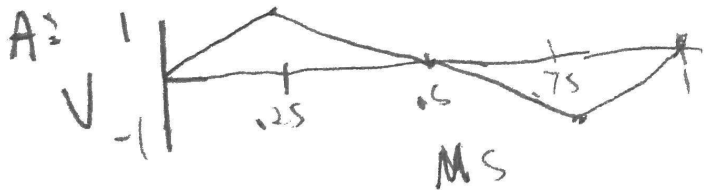


Circuit/Spec sheet parameters

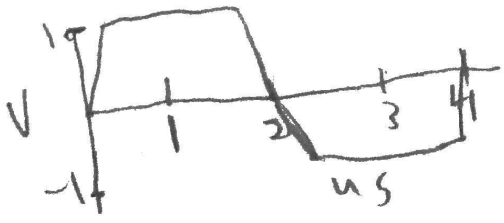
1) The saturation voltages for the above op-amp are 15/-15V.
2) The saturation output current for the above op-amp is +/- 20mA.
3) The slew rate for the above op-amp is 4V/μs.

For the following input signals, determine if the output appears as would be expected in an ideal circuit. Include sketches of the output voltage.

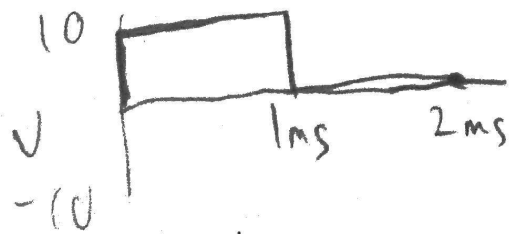
a) R1 = 100, R2 = 900, an open circuit load, and Vin is 4Vpp triangle wave with zero offset voltage and a period of 1μs.
b) R1 = 100, R2 = 900, an open circuit load, and Vin is 0.2Vpp square wave with zero offset voltage and a period of 4μs.
c) R1 = 100, R2 = 900, a 1kΩ load, and Vin is 2Vpp triangle wave with a 1V offset voltage (Vmax = 2V, Vmin = 0V) and a period of 2ms.
d) R1 = 100, R2 = 900, an open circuit load, and Vin is 2Vpp triangle wave with a 1V offset voltage (Vmax = 2V, Vmin = 0V) and a period of 2ms.

A: 

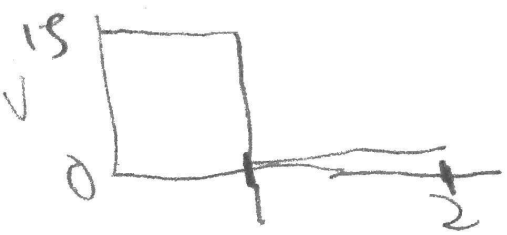
slew rate affects the amplitude

B: 10 : 1 = 1 

achieves expected value

C: 

Saturation ~~voltage~~ current

D:- 

Saturation voltage caps