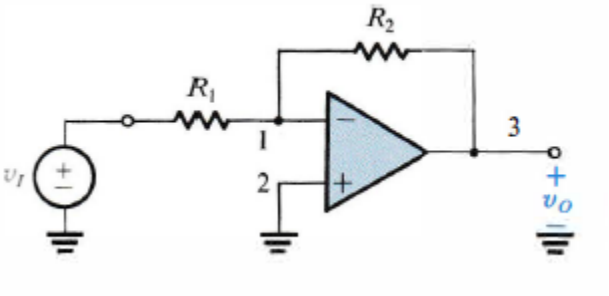
ECE 342: Electronic Circuits **Summer 2024**
Problem Set #11 **Professor Schutt-Aine**
Due Date: 5pm, Tue, July 30, 2024

1. If the feedback factor $\beta = 0.5$ and the phase margin is equal to 30 degrees, determine the magnitude and phase of the closed loop gain $A(\omega)$ at frequency ω_1 where the magnitude of the loop gain is unity, i.e., $|\beta A_f(\omega_1)| = 1$.

2. If the feedback factor $\beta = 0.5$ and the gain margin is equal to 20 dB, determine the magnitude and phase of the closed loop gain $A(\omega)$ at the frequency ω_{180} where the phase of the loop gain is -180 degrees.

3. An ideal op-amp is connected as shown below with $R_1 = 10k\Omega$ and $R_2 = 100k\Omega$. A symmetrical square-wave signal with levels of 0 V and 1 V is applied at the input. Sketch and clearly label the waveform of the resulting output voltage. What is its average value? What is its highest value? What is its lowest value?



4. The circuit shown below utilizes an ideal op amp.

a) Find I_1, I_2, I_3, I_L *and* V_x.

b) If V_o is not to be lower than -13 V, find the maximum allowed value for R_L.

c) If R_L is varied in the range 100 Ω to 1 $k\Omega$, what is the corresponding change in I_L and in V_o?