ECE3204 D2015
HW Set 2

Due in class Friday March 27.

To make life easier on the graders:

- Be sure your NAME and ECE MAILBOX NUMBER are prominently displayed on the upper right of what you hand in.
- When appropriate, indicate answers with a box or underline
- Work as neatly as possible

All problems from 6th edition

1)	Text 1.66	(p. 49)	[STC lowpass refresher]
2)	Text F.10	(p. F-7 on DVD)	[Transfer function, Bode plot practice]
3)	Text D2.13	(p. 110)	[Inverting op-amp design]
4)	Text D2.44	(p. 113)	[Noninverting op-amp design]
5)	Text 2.53	(p. 115)	[Unity gain buffer]
6)	Text 2.107	(p. 122)	[Op-amp open loop gain transfer function]
7)	Text 2.108	(p. 122)	[Op-amp open loop gain transfer function]
8)	Text 2.113	(p. 122)	[Gain-bandwidth product relationship]
9)	Text 2.114	(p. 122)	[Gain-bandwidth tradeoff]
10)	Text D2.86	(p. 120)	[Active single-pole lowpass filter]

This kind of configuration is often used prior to an analog-to-digital converter to combine the amplification and anti-aliasing lowpass filter functions in one circuit.

MORE ON THE FOLLOWING PAGES!!!

11) [Step response of active single-pole lowpass filter]

After completing the design of the previous problem, you have an inverting gain circuit with a DC gain magnitude of 20dB and a 3-dB frequency of 10kHz. Given that a negative-going input step waveform (transition from 0 to -1V) is applied at time t=0,

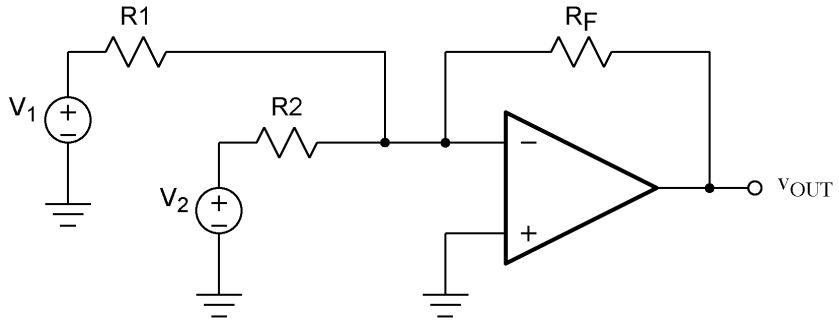
a) Sketch input V_i and output V_o waveforms

b) Find the 10%-to-90% risetime at V_o

c) Find the time at which the output V_o has settled to within 1mV of its final value.

12) [Ideal op-amp analysis refresher]

To find v_{OUT} for the ideal op-amp circuit below, perform the analysis in three different ways:



a) Thevenin: Replace $v_1/v_2/R_1/R_2$ with the Thevenin equivalent; then use the inverting gain equation.

b) Superposition: Suppress v_1 and find the output due to v_2; then suppress v_2 and find the output due to v_1; then add for the total output.

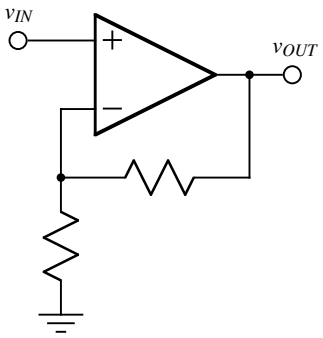
c) Virtual Ground: Use the virtual ground to calculate the currents in R_1 and R_2; then use KCL to determine the current in R_F; then find v_{OUT}.

Show that since all three methods give the same answer, you can use whichever technique you are most comfortable with when analyzing an op-amp circuit.

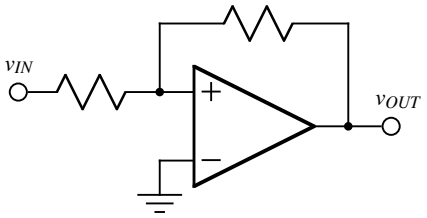
13) [Practice verifying negative feedback]

For each of the op-amp circuits shown below, determine if the op-amp is configured for negative or positive feedback.

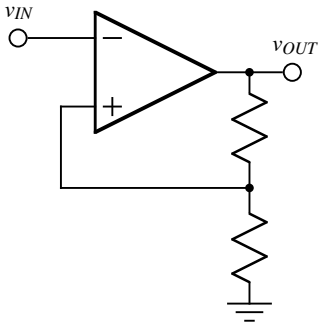
(a)



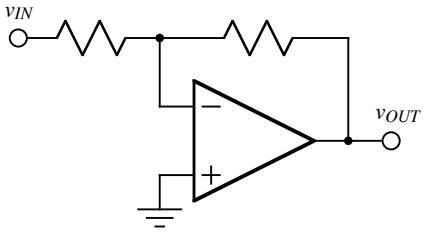
(b)



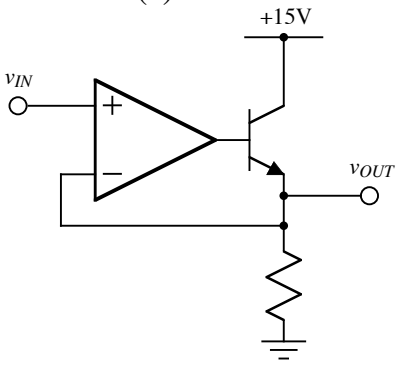
(c)



(d)



(e)



(f)