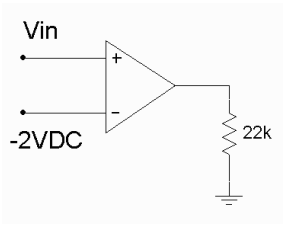
Operational Amplifiers **Practice Work Handout 1**

Assume +/-15VDC supplies and A_{ol}=200,000.

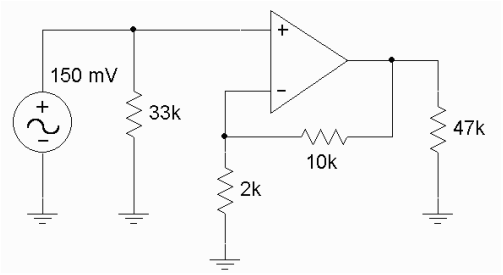
1. Perform the conversions below.

A_v = 40	A'_v =	dB
A'_v = -18 dB	A_v =	
P = .125 Watts	P' =	dBW
V' = -12 dBV	V =	Volts

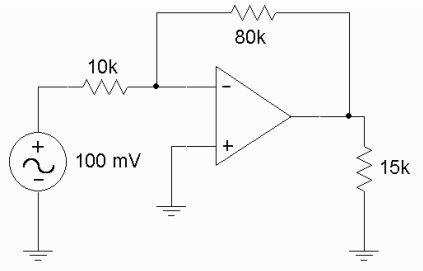
2. For the circuit below, sketch the output waveforms given inputs of +3VDC, 0VDC, and −5VDC.



3. Find the voltage gain, input impedance, and output voltage. If f_{unity} is 2 MHz, find f_2.



4. For the circuit below, find the voltage gain, input impedance, and output voltage. If slew rate is 2 volts per microsecond, find f_{max} (power bandwidth) for a 10 volt peak output.



Operational Amplifiers Practice Work Handout 1 Answers

1. Perform the conversions below.

   $A'_v = 20*\log_{10}A_v$ = 32 dB (note this is 2*2*10, or 6dB+6dB+20dB)

   $A_v = 10\text{^}(A'_v/20)$ = .125 (the equation above, "backwards")

   $P' = 10*\log_{10}(P/P_{ref})$ (where dBW uses 1 W ref) = -9 dBW

   (or, .5*.5*.5 which is -3dB-3dB-3dB)

   V = Vref*10^(V'/20) (where ref = 1 Volt) = .25 Volts

   (or, -6dB-6dB, which is .5*.5=.25)

2. Sketch the output waveforms given inputs of +3VDC, 0VDC, and –5VDC.

The reference is -2V so anything larger than this produces positive saturation (about +13 to +14VDC, for inputs one and two) while anything less than -2V produces negative saturation (about -13 to -14VDC, for input three).

3. Find the voltage gain, input impedance, and output voltage. If f_{unity} is 2 MHz, find f_2.

Z_{in} is set by the 33k.

$A_v = 1+R_f/R_i = 1+10k/2k = 6.$

$f_2 = f_{unity}/A_{noise}$ = 2MHz/6 = 333kHz. (note $A_n = A_v$ for this amplifier)

4. Find the voltage gain, input impedance, and output voltage. If slew rate is 2 volts per microsecond, find f_{max} (power bandwidth) for a 10 volt peak output.

Z_{in} is set by R_i = 10k.

$A_v = -R_f/R_i = -80k/10k = -8.$

$V_{out} = V_{in}*A_v$ = .1V * (-8) = .8 volts inverted.

$f_{max} = SR/(2*pi*V_{peak})$ = 2E6/(2*pi*10V) = 31.8 kHz

(note 2 V/uSec = 2E6 V/Sec)