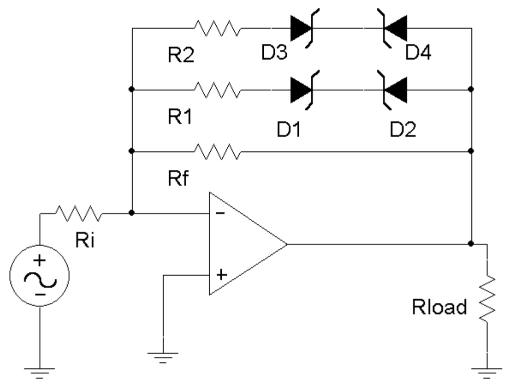
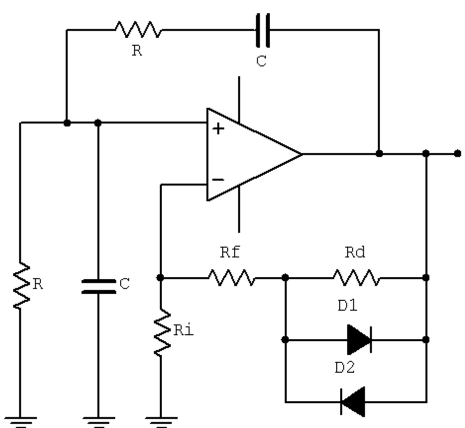
Op Amps Practice 3

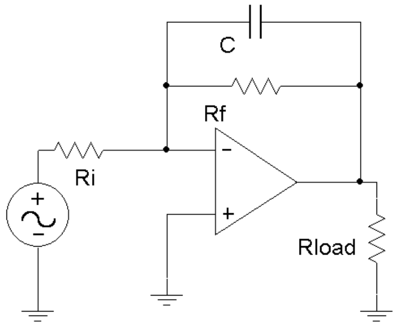
1. For the circuit below, draw the input-output transfer curve. Indicate the gains (slopes) and breakpoint voltages. R_i=10k, R_f=60k, R_1=120k, R_2=40k, R_{load}=22k, D_1=D_2=3.3V, D_3=D_4=5.1V



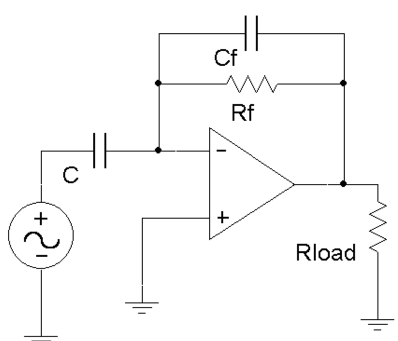
2. Determine the frequency of oscillation of the circuit below. Ri=10k, Rf=15k, Rd=8k, R=20k, C=.1uF



3. For the integrator below, determine f_{low} and the output if the input is a .2 volt peak sine wave at 500 Hz. Ri=10k, Rf=200k, C=50nF



4. For the differentiator below, determine f_{high} and the output if the input is a .1 volt peak sine wave at 1000 Hz. Rf=50k, Cf=100pF, C=50nF



Answers

1. Base gain is -60k/10k = -6. First output breakpoint is

2. f = 1/(2*pi*R*C) = 1/(2*pi*20k*.1uF) = 79.6 Hz
Note that the max forward gain is 1 + (15k+8k)/10k = 3.3, which is sufficient to start oscillation for a Wien bridge oscillator (need>3). As the signal increases, the diodes begin to conduct thus dropping the effective gain to 3 to achieve a stable, unclipped output.

3. f_{low}=1/(2pi*200k*50nF)=15.9 Hz. Amplitude of output is -.2V*1/(10k*50nF)/(2pi500)= -.127V (V_{out}=.127cos(2pi500t))

4. f_{high}=1/(2pi*50k*100pF)=31.8kHz. Amplitude of output is -.1V*(50k*50nF)*(2pi1000)= -1.57V (V_{out}=-1.57cos(2pi1000t))