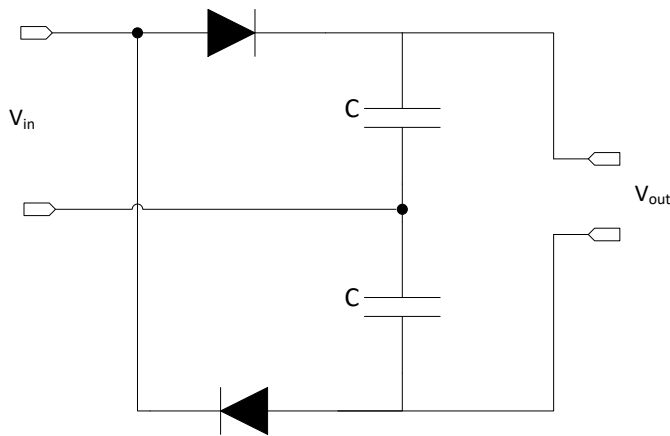


Contemporary Electronics PH351001
 Fall 2017
 Homework Assignment 3

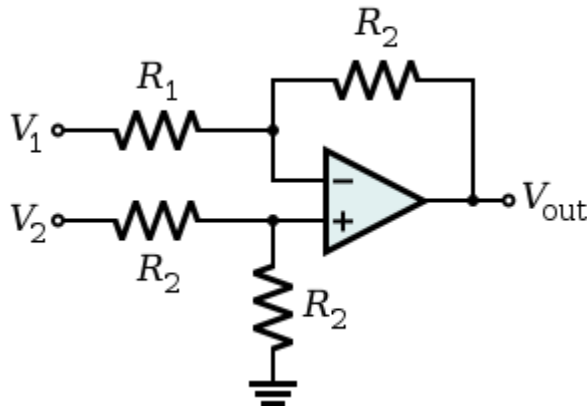
There are **5** problems in this homework assignment, due December 14, 2017

1. Design a common-emitter *npn* amplifier (similar to what you built in Lab 4) with a voltage gain of 15, V_{cc} (supply voltage) of +12volts, I_c of 0.5mA. Bias the collector at $0.5V_{cc}$, and put the low-frequency 3dB point at 100Hz. (i.e. the gain drops 30% at 100Hz.)



2. In the schematic above, assume V_{in} is a sine wave of 10 volts peak-to-peak, and the diodes are perfect diodes. What is the size of the DC voltage at V_{out} ?

3. Explain how in an inverting op-amp circuit, negative feedback changes the input impedance of the amplifier.



4. Derive an expression for the input impedance of the differential amplifier above.

5. Using the op-amp circuits that also contained diodes that we covered in class as building blocks in addition to op-amp circuits that don't have diodes, sketch a circuit for which the output voltage is V_{in}^3 . (Third power of the input.)

(Hint: This problem isn't as hard as it sounds, so don't over complicate it. But it will require a few op-amps.)

(Reminder: Unless you specify resistor values as numbers or ratios, it's very unlikely you can show your design does what you claim.)