1) I wish to measure a very low resistance (of the order of an ohm) accurately. What should I do and why?

2) Assume that $R_1=3*R_2$ and that the input signal is a sine from $-10$V to $+10$V. Assume the output saturation voltage is $\pm 12$ V.

Draw the output waveform superimposed on the input waveform.

3) A square wave is input to a circuit, and the output is the rounded function as shown. Design two circuits to perform this function – one using a capacitor and one using an inductor. Let $R=1$kOhm.

4) Write an equation for $V_{out}$ in terms of $V_1$, $V_2$, and any necessary $R$’s.

5) Design an op-amp based current-voltage amplifier with gain 25 V/mA.
6) An op-amp with unity gain frequency of 5 MHz is connected in a feedback circuit as shown at the right. The open loop DC gain of the op-amp is $10^5$. What is the closed loop gain at 50 KHz?

7) Roughly draw the V vs. I curve for a diode. Make sure you label the axes and show the 0.6 V drop for a silicon diode.

8) The transistor circuit drawn below has $R_1=20k$, $R_2=5k$, $R_c=1.5K$, $R_e=0.4k$. Figure out the DC or quiescent voltages and the small signal voltage gain. Do not ignore the effect of the intrinsic emitter resistance $R_e$.

9) Implement the OR operation $(A + B)$ using only NAND gates.

10) Using NOR gates, show how AND, OR, and NAND can be made.

11) Reduce the following Boolean expressions to their simplest forms

   a) $ABCD + \overline{ABCD}$

   b) $AB + \overline{AC} + \overline{ABC}(\overline{AB} + C)$

   c) $A(\overline{AB} + B)$
12) I wish to make a mod-100 ripple-through counter using JK flip flops. How many flip flops do I need to use?

13) What is the advantage of a synchronous counter compared to a ripple-through counter?

14) What were the best and worst parts about the class? Please give constructive criticism about how it can be improved in the future.