

## Lab 1 Circuit simulation with Multisim

In this lab you will simulate several different circuits using the Multisim software. Multisim is available on the computers in the Digital Electronics Lab, Workman 116. These exercises should be carried out on your own time, and should be completed and entered in your lab book prior to Lab 2, which takes place on Monday January 31. Lab 1 will be graded when you hand in your lab book after Lab 2.

### Current mirror

1. Design the current mirrors in HH Figures 2.45 and 2.47 for an output current of 1 mA
2. Plot the current as a function of load resistance for each, on the same figure. Is there a “resistance sweep” function in Multisim that you can use for this?
3. Notice that at some resistance the circuit switches from supplying a constant current to supplying at constant voltage. Why does this happen?
4. Which is a better current mirror?

### Amplifier frequency response

5. Design two inverting amplifiers with a gain of -11 using the 741 and 411 op-amps.
6. Plot, on the same figure, the frequency response of the two resulting amplifiers. Is there a “frequency sweep” function in Multisim that you can use for this?
7. What is the 3dB frequency? This is the bandwidth of the amplifier. Is the low-frequency gain times the bandwidth equal to the gain-bandwidth-product (GBWP) listed in the data sheets?