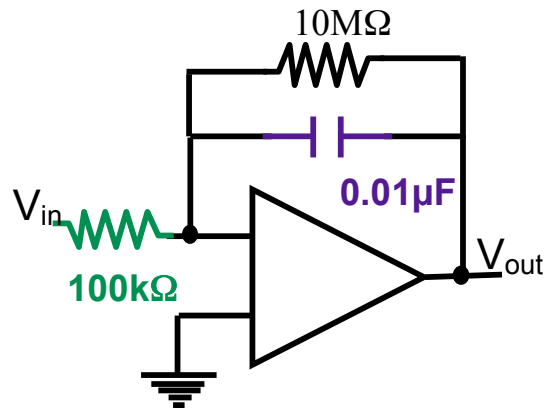


Experiment 1: Integrator

- a) Construct the circuit shown on the right. (The 10 M Ω resistor in the circuit prevents the inherent lack of symmetry in the inputs from building up over time and causing the output of the op-amp to sail off to the supply rails. The resistor leaks off a small current undoing the effect of the small current going into the inputs.)



- b) Drive the circuit with a 1 kHz square wave. What do you observe with regard to the shape and amplitude of the output wave relative to the input wave? This circuit is very sensitive to DC offsets in your input signal. If the output is supply railed, check to see if your input signal is symmetric about zero volts. If not, you can adjust it with the DC offset on the function generator.
- c) Predict the peak to peak wave amplitude at the output that should result from a 2.0 V pp, 500 Hz square wave input. Try it. Compare your measurement to your calculation.
- d) In the passive integrator, the circuit only began to integrate when $V_o \ll V_{in}$. This occurred roughly at a frequency a factor of 10 different from $f=1/(2\pi RC)$. How does the active circuit's dependence on frequency compare to the passive one?

Experiment 2: Differentiator

- a) Construct the circuit shown on the right. The 100 pF feedback capacitor and the 1 k Ω resistor are in the circuit to prevent the inherent instability in the circuit.)
- b) Drive the circuit with a 1 kHz square wave. What do you observe about the wave amplitude and shape relative to the input?
- c) What do you observe when you drive the circuit with a 1 kHz sine wave?
- d) What do you observe when you drive the circuit with a 1 kHz triangle wave?
- e) In the passive differentiator, the circuit only began to differentiate when $V_o \ll V_{in}$. This occurred roughly at a frequency a factor of 10 different from $f=1/(2\pi RC)$. How does the active circuit's dependence on frequency compare to the passive one?

