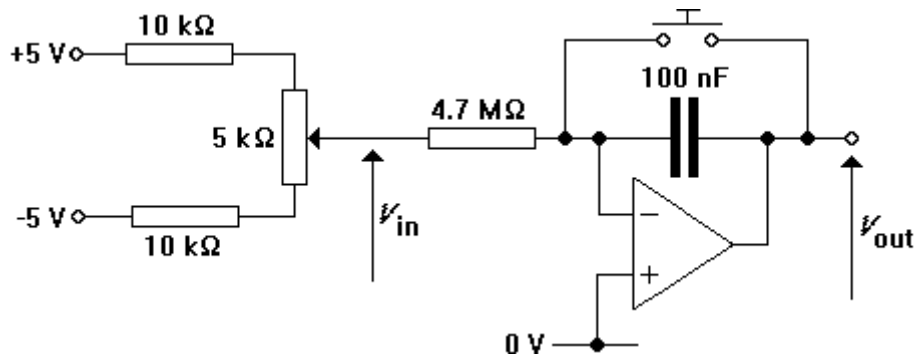


## Generating ramps

1. Assemble the ramp generator circuit shown below. Use a TL081.



2. Use a double-beam oscilloscope to look at  $V_{in}$  and  $V_{out}$ . Have 0 V in the centre of the screen. If all is well,  $V_{in}$  should cover the range +1 V to -1 V as you adjust the potentiometer.
3. Set  $V_{in}$  to -0.5 V. Press the switch and release it. Time how long it takes for  $V_{out}$  to change by 2.5 V. If all is well, it should be about 3 s.
4. Use the formula below to calculate the time  $\delta t$  needed for  $V_{out}$  to change by 2.5 V. How well does it match the actual time?
 
$$\frac{\delta V_{out}}{\delta t} = -\frac{V_{in}}{RC}$$
5. Repeat steps 3 and 4 with  $V_{in}$  set at a variety of values between -1.0 V and +1.0 V.