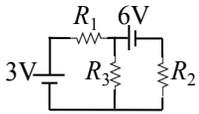


1. (30%) A resistive metal wire has a diameter  $D$  and length  $L$ . When a potential difference  $\Delta V$  is applied to both ends of the wire, it generates heat at a rate of  $P$ . Now cut the wire into two halves and pull one half into a new wire of a diameter  $\frac{1}{2}D$ . Connect this new wire back to the other half and apply the same potential difference  $\Delta V$ . What is the rate of heat generated by the wire now? Ignore the resistivity change due to temperature of the wire.

2. (30%) Find the potential difference across  $R_3$ , when  $R_1 = 3\Omega$ ,  $R_2 = 9\Omega$ , and  $R_3 = 6\Omega$ .



3. (40%) The voltage source sends out a step pulse from  $0V$  to  $V_0$  at  $t = 0$ . Sketch out the voltage over the resistor  $R$  as a function of time  $t$ , and find the value of  $t$  when the voltage over this resistor reads 50% of  $V_0$ .

