Homework, Chapter 4

1) A battery having an emf of 9.00 V delivers 117 mA when connected to a 72.0-Ω load. Determine the internal resistance of the battery.
2) A 4.0-Ω resistor, an 8.0-Ω resistor, and a 12-Ω resistor are connected in series with a 24-V battery. What are (a) the equivalent resistance and (b) the current in each resistor? (c) Repeat for the case in which all three resistors are connected in parallel across the battery.
3) A 9.0-Ω resistor and a 6.0-Ω resistor are connected in series with a power supply. (a) The voltage drop across the 6.0-Ω resistor is measured to be 12 V. Find the voltage output of the power supply. (b) The two resistors are connected in parallel across a power supply, and the current through the 9.0-Ω resistor is found to be 0.25 A. Find the voltage setting of the power supply.
4) Find the equivalent resistance of the circuit in this figure. Find the current and resistance in each resistor.

![Diagram of the circuit]

\[ R_1 = 1 \, \Omega \quad R_2 = 1 \, \Omega \quad R_3 = 2 \, \Omega \quad R_4 = 2 \, \Omega \quad R_5 = 1 \, \Omega \]

12 V
5) (a) Find the equivalent resistance of the circuit in this figure. (b) If the total power supplied to the circuit is 4.00 W, find the emf of the battery.
6) The ammeter shown in this figure reads 1.789 A, flowing in the direction indicated (downward). Find $I_1$ and $I_3$. 

![Circuit Diagram]

$V_1 = 10$ V, $V_2 = 20$ V, $V_3 = 12$ V,

$R_1 = 3$ Ω, $R_2 = 4$ Ω, $R_3 = 1$ Ω.
7) Determine the current in each branch of the circuit shown in this figure.

![Circuit Diagram]

- Voltage sources: 10 V, 12 V
- Resistances: 2 Ω, 5 Ω, 1 Ω
8) Consider a series RC circuit for which $C = 6.0 \, \mu F$, $R = 2.0 \times 10^6 \, \Omega$, and $\varepsilon = 20V$. Find (a) the time constant of the circuit and (b) the maximum charge on the capacitor after a switch in the circuit is dosed.
9) Consider a series RC circuit for which $R = 1.0 \, \text{M}\Omega$, $C = 5.0 \, \mu\text{F}$, and $\varepsilon = 30 \, \text{V}$. Find the charge on the capacitor 10 s after the switch is closed.
10) An electric heater is rated at 1300 W, a toaster at 1000 W, and an electric grill at 1500 W. The three appliances are connected in parallel to a common 120-V circuit. (a) How much current does each appliance draw? (b) Is a 30.0-A circuit breaker sufficient in this situation? Explain.