Equations

1. $P = \frac{dW}{dt} = IV$

2. $I = \frac{dq}{dt}$

3. $V = \frac{W}{q}$

4. $R = \frac{\rho L}{A}$

5. Ohm's Law: $V = IR$

6. Coulomb's Law: $\vec{F} = \frac{1}{4\pi\epsilon_0}\frac{q_1 q_2}{r^2}\hat{r}$

7. Kirchhoff's Voltage Law: $\sum V_i = 0$

8. Conductance: $G = \frac{1}{R}$

9. Equivalent resistance: $R_{eq} = \frac{V_{test}}{I_{test}}$

(R_{eq}) Turn off all independent sources (dependent sources remain unchanged) and calculate the resulting resistance at the desired port. Notice that you may have to apply the i-v test if resistors cannot be combined through series and parallel connections, or if the circuit includes dependent sources.

(V_{th}) Leave the desired port open-circuited (i.e. no load connected) and find the voltage across it.

(I_N) Short-circuit the desired port (i.e. connect a short circuit across the port) and find the current through it.