$$\vec{\mathbf{F}} = k\frac{qq}{r^2}\hat{\mathbf{r}} \qquad \oint_{\text{surface}} \vec{\mathbf{E}} \cdot d\vec{\mathbf{A}} = \frac{q_{\text{in}}}{\epsilon_o} \qquad \vec{\mathbf{E}} = k\frac{q}{r^2}\hat{\mathbf{r}}$$

$$\Phi_E = \int_{\text{surface}} \vec{\mathbf{E}} \cdot d\vec{\mathbf{A}} \qquad \vec{\mathbf{F}} = q\vec{\mathbf{E}} \qquad \vec{\mathbf{E}} = k\int \frac{dq}{r^2}\hat{\mathbf{r}}$$

$$dq = \lambda\, dl \qquad dq = \sigma\, dA \qquad dq = \rho\, dV$$

$$k = 8.987 \times 10^9\, \frac{\mathrm{N \cdot m^2}}{\mathrm{C^2}} \qquad \epsilon_o = 8.854 \times 10^{-12}\, \frac{\mathrm{C^2}}{\mathrm{N \cdot m^2}}$$

$$V = k\frac{q}{r} \qquad U = k\frac{q_1 q_2}{r_{12}} \qquad V = k\int \frac{dq}{r}$$

$$E_x = -\frac{\partial V}{\partial x} \qquad E_y = -\frac{\partial V}{\partial y} \qquad E_z = -\frac{\partial V}{\partial z}$$

$$C = \frac{Q}{\Delta V} \qquad U = \frac{1}{2}C(\Delta V)^2 \qquad R = \frac{\rho l}{A} \qquad R = \frac{\Delta V}{I} \qquad P = I\Delta V$$

$$R_{eq} = R_1 + R_2 + ... \qquad \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + ...$$

$$C_{eq} = C_1 + C_2 + ... \qquad \frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + ...$$

$$\rho_{_{Cu}} = 1.7 \times 10^{-8}\, \Omega \cdot \mathrm{m}$$