Tear-Off Sheet **Tear-Off Sheet**

Some (possibly useful) Relations for 8.02 Test 1

You may use these freely unless the problem specifically prescribes a different approach.

$$\mathbf{F} = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}\,\hat{\mathbf{r}}$$

$$\mathbf{F} = q\mathbf{E}$$

$$\varepsilon_0 \cong 9\times 10^{-12}\ \mathrm{C^2\ N^{-1}\ m^{-2}}$$

$$\frac{1}{4\pi\varepsilon_0} \cong 9\times 10^{9}\ \mathrm{N\ m^2\ C^{-2}}$$

$$\oint\!\!\oint \mathbf{E}\cdot d\mathbf{A} = \frac{q_{in}}{\varepsilon_0}$$

$$C \equiv \frac{Q}{\Delta V}$$

$$U_E = \frac{C(\Delta V)^2}{2} = \frac{Q^2}{2C}$$

$$V(b) - V(a) \equiv -\int_a^b \mathbf{E}\cdot d\mathbf{s}$$

$$\mathbf{E} = -\left(\frac{\partial V}{\partial x}\hat{\mathbf{x}} + \frac{\partial V}{\partial y}\hat{\mathbf{y}} + \frac{\partial V}{\partial z}\hat{\mathbf{z}}\right)$$

$$u_E = \frac{1}{2}\varepsilon_0\,\mathbf{E}\cdot\mathbf{E} = \frac{1}{2}\varepsilon_0\,|\mathbf{E}|^2$$

$$\Phi_E = \iint \mathbf{E}\cdot d\mathbf{A}$$