Answers Test 1 2012

1. $\vec{F} = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_3 L}{(L^2+H^2)^{3/2}} \vec{i}_x + \frac{1}{4\pi\varepsilon_0} \left[\frac{q_1 q_3 H}{(L^2+H^2)^{3/2}} - \frac{q_1 q_2}{H^2} \right] \vec{i}$

2. $\vec{E}_{tot} = \frac{1}{4\pi\varepsilon_0} \int_0^A \frac{Q_1}{A} \frac{dx}{(R+A-x)^2} \vec{i}_x - \frac{Q_2}{2\pi^2 \varepsilon_0 R^2} \vec{i}_y$

3. a) $\Phi = 0$

   b) $\Phi = \alpha a^4$

   c) $Q = \alpha \varepsilon_0 a^4$

4. a) $V(x_2, y_2) - V(x_1, y_1) = -\left[E_0 (x_2 - x_1) + \frac{\alpha}{3} (y_2^3 - y_1^3) \right]$

   b) $V(x_2, y_2) - V(x_1, y_1) = \frac{\beta}{5(x_2^2 + y_2^2)^{5/2}} - \frac{\beta}{5(x_1^2 + y_1^2)^{5/2}}$