Answers exam 1 2013

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

2. a) $E_z = \frac{1}{4\pi\varepsilon_0} \frac{QL}{(R^2+L^2)^{3/2}}$

b) $E_z = \frac{1}{4\pi\varepsilon_0} \frac{\lambda_0 L R}{(R^2+L^2)^{3/2}} \int_0^{2\pi} \cos^2\varphi \, d\varphi = \frac{1}{4\varepsilon_0} \frac{\lambda_0 L R}{(L^2+R^2)^{3/2}}$

3. $V(3R) - V(0) = -\frac{Q}{6\pi\varepsilon_0 R}$

4. a) $\Phi = c_1 (B+L) L^2$

b) $\Phi = \frac{c_3 L}{2}\left[(B+L)^2 - B^2\right]$