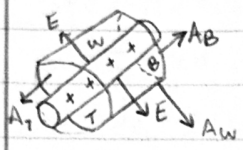
Test 3 PH 112

Example #1



$\cos 90 = 0$

$\Phi_{tot} = \Phi_T + \Phi_W + \Phi_B$

$\Phi = E \cdot A = EA\cos\theta \Rightarrow EA_W = \frac{Q}{\varepsilon_0}$

$E = \frac{Q}{\varepsilon_0 A_W} = \frac{Q}{\varepsilon_0 2\pi r L} = \boxed{\frac{\lambda}{2\pi\varepsilon_0 r}}$

Electric force

Field calculations (multiple, continuous)

Motion of charge in uniform field

Gauss' law

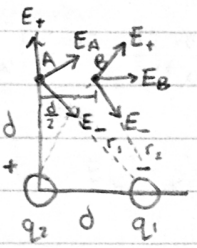
* Example #2

$q_1 = -50\,\mu C \times 10^{-6}\ C$

$q_2 = 50\,\mu C \times 10^{-6}\ C$

$d = 52\ cm \times 10^{-2}\ m$

$E_A = ?\quad E_B = ?$



$E_A = E_+ + E_-$

$E_{Ax} = 0 + E_-\cos\theta = k\frac{q_1}{r_1^2}\frac{d}{r_1}$

$E_{Ay} = E_+ - E_-\sin\theta = k\frac{q_1}{d^2} - k\frac{q_1}{r_1^3}\frac{d}{r_1}$

$E_{Ax} = \frac{kq}{2d^2}\frac{1}{\sqrt{2}} = \frac{1}{4\pi\varepsilon_0}\frac{-50}{2\sqrt{2}(.52)^2}$

$E_{Ay} = \frac{kq}{d^2} - \frac{kq}{2d^2}\frac{1}{\sqrt{2}} = \frac{1}{4\pi\varepsilon_0}\left(\frac{50}{(.52)^2} + \frac{50}{2\sqrt{2}(.52)^2}\right)$

$E_A = \sqrt{E_{Ax}^2 + E_{Ay}^2}$

$E_B = E_+ + E_-\quad E_{By} = 0$

$E_{Bx} = E_B = E_+\cos\alpha + E_-\cos\alpha = 2E\cos\alpha = 2k\frac{q}{r_2^2}\frac{d}{2r_2} = \frac{kqd}{r_2^3}$