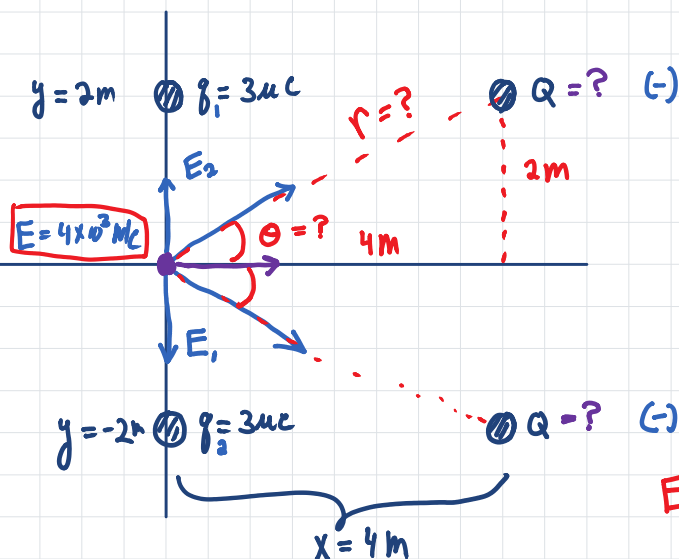


Final Exam Review

Monday, April 28, 2014 7:52 AM



$$r = \sqrt{(2m)^2 + (4m)^2}$$

$$r = 4.47m$$

$$\theta = \tan^{-1}\left(\frac{2m}{4m}\right)$$

$$\theta = 26.56^\circ$$

$$E_q = k \frac{Q}{r^2}$$

$$\sum E_x = 2 E_q \cos \theta$$

$$E = 2 E_q \cos \theta$$

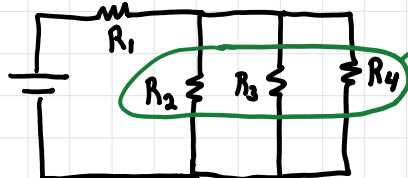
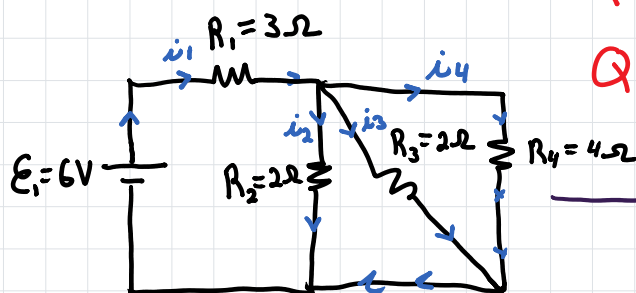
$$E = 2 \left(k \frac{Q}{r^2} \right) \cos \theta$$

$$Q = \frac{E r^2}{2 k \cos \theta}$$

$$Q = \frac{(4 \times 10^3 N/C) (4.47m)^2}{2 (9 \times 10^9 N \cdot m^2/C^2) \cos(26.56^\circ)}$$

$$Q = 4.9 \times 10^{-6} C$$

$$Q = -4.9 \times 10^{-6} C$$



$$\frac{1}{R_{234}} = \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$$

$$\frac{1}{R_{234}} = \frac{1}{2\Omega} + \frac{1}{2\Omega} + \frac{1}{4\Omega}$$

$$\frac{1}{R_{234}} = \frac{2}{4\Omega} + \frac{2}{4\Omega} + \frac{1}{4\Omega}$$

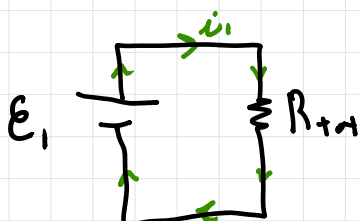
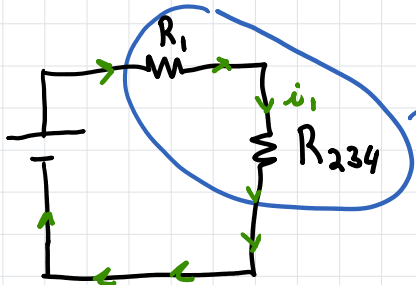
$$\frac{1}{R_{234}} = \frac{5}{4\Omega}$$

$$R_{234} = \frac{4}{5} \Omega$$

$$R_{234} = .8\Omega$$

$$R_{tot} = R_{234} + R_1$$

$$R_{tot} = .8\Omega + 3\Omega = 3.8\Omega$$



$$E = i R$$

$$i_1 = \frac{E_1}{R_{tot}} = \frac{6V}{3.8\Omega} = 1.58A$$

$$V_{234} = i_1 R_{234} = (1.58A)(.8\Omega) = 1.26V$$

$$V_2 = V_3 = V_4 = 1.26V$$

$$i_4 = \frac{V_4}{R_4} = \frac{1.26V}{4\Omega}$$

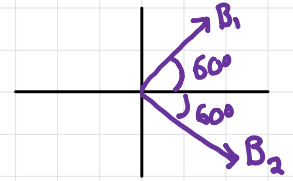
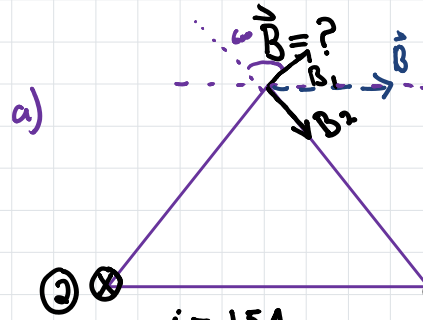
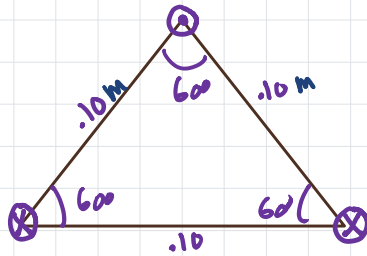
$$i_2 = \frac{V_2}{R_2} = \frac{1.26V}{2\Omega} = .63A$$

$$i_4 = .315A$$

$$i_2 = \frac{V_2}{R_2} = \frac{1.26V}{2\Omega} = .63A$$

$$i_3 = \frac{V_3}{R_3} = \frac{1.26V}{2\Omega} = .63A$$

$$i_4 = .315A$$



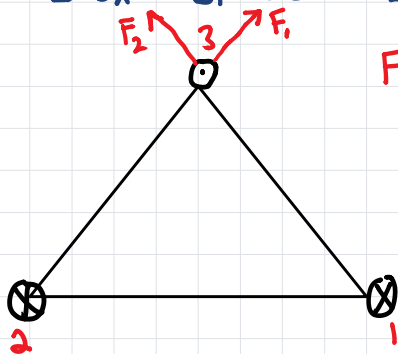
$$i = 15A$$

$$B_1 = B_2 = \frac{\mu_0 i}{2\pi r} = \frac{4\pi \times 10^{-7} T \cdot m}{2\pi (.1m)} (15A)$$

$$B_1 = B_2 = 3 \times 10^{-5} T$$

$$\sum B_y = 0$$

$$\sum B_x = B_1 \cos \theta + B_2 \cos \theta = 2B \cos \theta = 2(3 \times 10^{-5} T) \cos(60^\circ) = 3 \times 10^{-5} T$$



$$F = \frac{\mu_0 i_1 i_3 l}{2\pi d}$$

$$or \quad i \odot \xrightarrow{F} \vec{B}$$

$$F = i l B \sin \phi$$

$$\frac{F}{l} = i B$$

$$\frac{F}{l} = (15A)(3 \times 10^{-5} T)$$

$$\frac{F}{l} = 4.5 \times 10^{-4} N/m$$