Example 1

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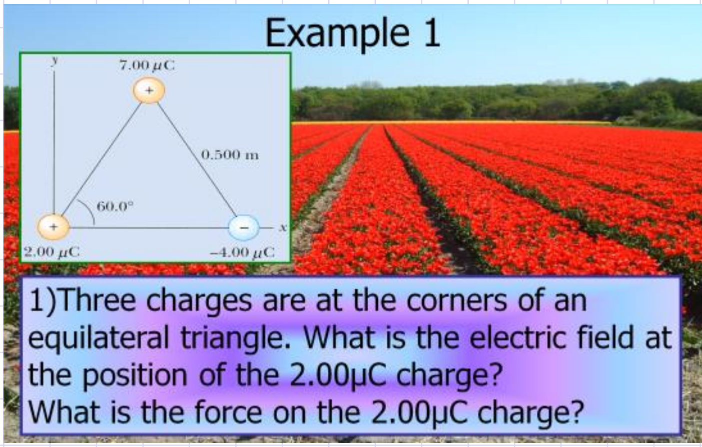
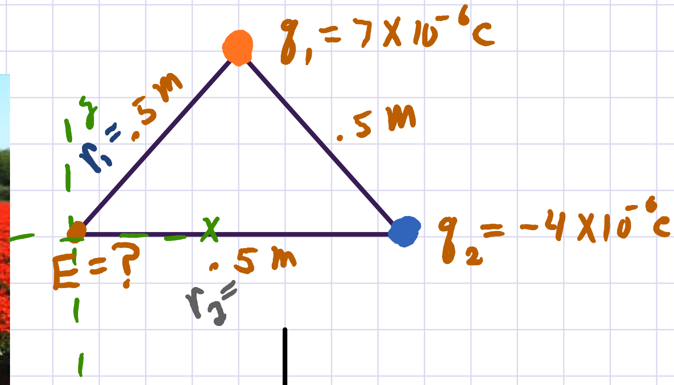
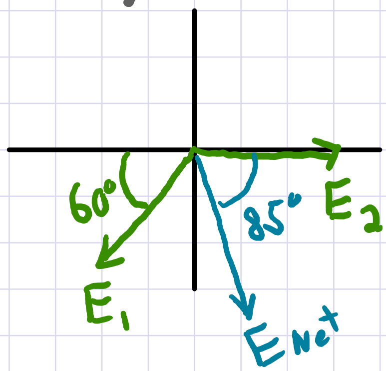






$$E_1 = k\frac{q_1}{r_1^2}$$

$$E_1 = \left(9\times10^9 N\frac{m^2}{C^2}\right)\frac{(7\times10^{-6} C)}{(.5 m)^2}$$

$$E_1 = 2.52\times10^5 \frac{N}{C}$$

$$E_2 = k\frac{q_2}{r_2^2}$$

$$E_2 = \left(9\times10^9 N\frac{m^2}{C^2}\right)\frac{(4\times10^{-6} C)}{(.5 m)^2}$$

$$E_2 = 1.44\times10^5 \ N/C$$

$$\Sigma E_x = -E_1 \cos(60°) + E_2 = -(2.52\times10^5 N/C)\cos(60°) + 1.44\times10^5 N/C$$

$$\Sigma E_x = 1.8\times10^4 \ N/C$$

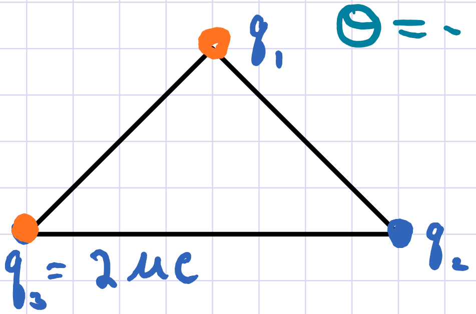
$$\Sigma E_y = -E_1 \sin(60°) = -(2.52\times10^5 N/C)\sin(60°)$$

$$\Sigma E_y = -2.18\times10^5 \ N/C$$

$$|E_{Net}| = \sqrt{(\Sigma E_x)^2 + (\Sigma E_y)^2}$$

$$|E_{Net}| = \sqrt{(1.8\times10^4 N/C)^2 + (-2.18\times10^5 N/C)^2} = 2.18\times10^5$$

$$\theta = \tan^{-1}\left(\frac{\Sigma E_y}{\Sigma E_x}\right) = \tan^{-1}\left(\frac{-2.18\times10^5 N/C}{1.44\times10^4 N/C}\right)$$



$\theta = -85°$ (below (+) X axis

$F = E\, q_3$

$F = (2.18 \times 10^{5}\ N/C)(2 \times 10^{-6}\ C)$

$F = .436\ N$ 85° below (+) X axis

if q_3 was (−) 85° above (−) X axis

Example 2

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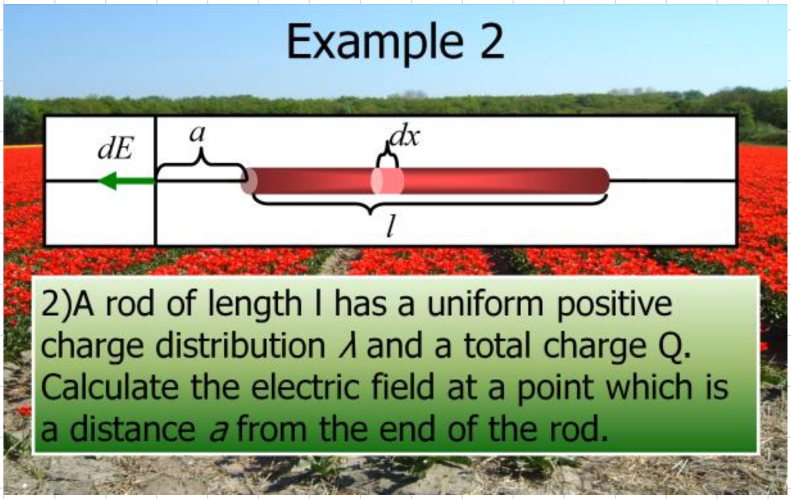

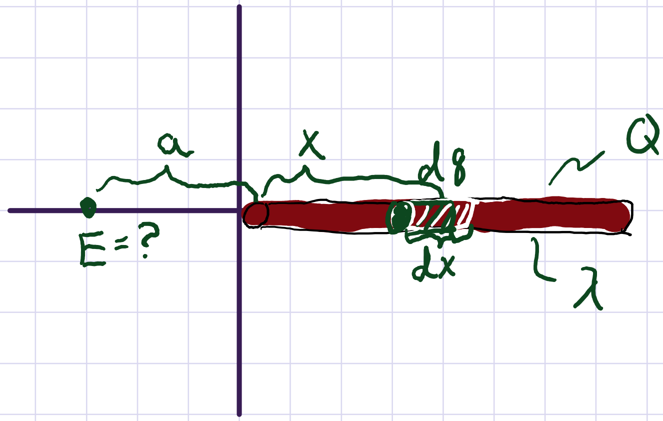

$$dE = k \frac{dq}{(a+x)^2} \qquad z = a + x$$

$$dE = k \frac{\lambda\, dx}{(a+x)^2} \qquad dz = dx$$

$$\int dE = \int_0^l k \frac{\lambda\, dx}{(a+x)^2}$$

$$E = k\lambda \int_0^l \frac{dx}{(a+x)^2}$$

$$E = k\lambda \int_a^{a+l} \frac{dz}{z^2}$$

$$E = k\lambda \left[\frac{1}{-1} z^{-1} \right]_a^{a+l}$$

$$E = k\lambda \left[\frac{-1}{z} \right]_a^{a+l}$$

$$E = k\lambda \left[\frac{-1}{a+l} - \left(\frac{-1}{a} \right) \right]$$

$$E = k\lambda \left[\frac{-1}{a+l} + \frac{1}{a} \right]$$

$$E = k\lambda \left[\frac{-a}{a(a+l)} + \frac{a+l}{a(a+l)} \right]$$

$$E = k\lambda \left(\frac{l}{a(a+l)} \right) = k \frac{Q}{a(a+l)}$$

$\lambda = \frac{Q}{L}$

Example 3

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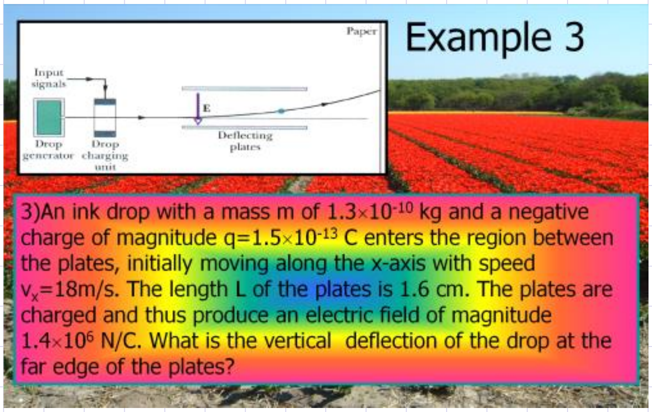
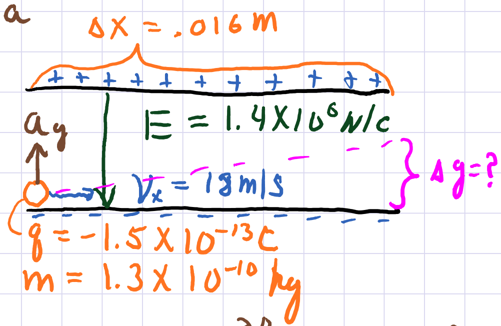
$F = Eq$ and $F = ma$





$$\Delta y = v_{y_0} t + \frac{1}{2} a_y t^2$$

$$\Delta y = \frac{1}{2} a_y t^2$$

$$\Delta x = v_x t$$

$$t = \frac{\Delta x}{v_x} = \frac{.016\ m}{18\ m/s} = 8.89 \times 10^{-4}\ s$$

$$a_y = \frac{Eq}{m}$$

$$a_y = \frac{(1.4 \times 10^6\ N/C)(1.5 \times 10^{-13}\ C)}{1.3 \times 10^{-10}\ kg}$$

$$a_y = 1.615 \times 10^3\ m/s^2$$

$$\Delta y = \frac{1}{2}(1.615 \times 10^3\ m/s^2)(8.89 \times 10^{-4}\ s)^2$$

$$\Delta y = 6.38 \times 10^{-4}\ m$$