UIL Electric Field & Force

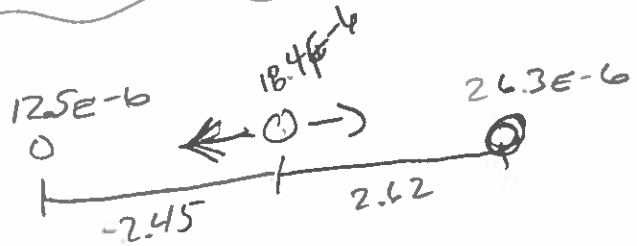
Key

P13. A 7.50 μC charge is placed at the origin. What is the electric potential at a point on the x-axis where x = 3.88 m?

A) 6.24 V
B) 50.7 V
C) 399 V
D) 4,480 V
E) 17,400 V

$V = \frac{kq}{r} = \frac{9E9(7.5E-6)}{3.88} = 17,396$

P13. A 12.5 μC charge is placed on the x-axis at $x = -2.45$ m. A 26.3 μC charge is placed on the x-axis at $x = 2.62$ m. What is the magnitude of the net electric force on an 18.4 μC charge placed at the origin?



A) 0.289 N
B) 0.978 N
C) 4.84 N
D) 71.2 N
E) 123 N

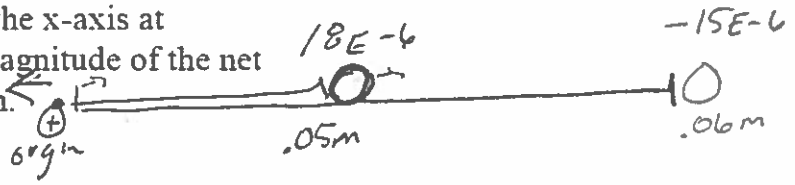
$F = \frac{kqq}{r^2}$

$F_1 = \frac{9E9(12.5E-6)(18.4E-6)}{(2.45)^2} = .345$

$F_2 = \frac{9E9(18.4E-6)(26.3E-6)}{2.62^2} = .634$

$.634 - .345 = .289N$

P13. A particle with a charge of 18.0 μC is located on the x-axis at x = 5.00 cm. A second particle with a charge of −15.0 μC is located on the x-axis at x = 6.00 cm. Find the magnitude of the net electric field at the origin.



A) 18,300,000 N/C
B) 21,300,000 N/C
C) 24,300,000 N/C
D) 27,300,000 N/C
E) 30,300,000 N/C

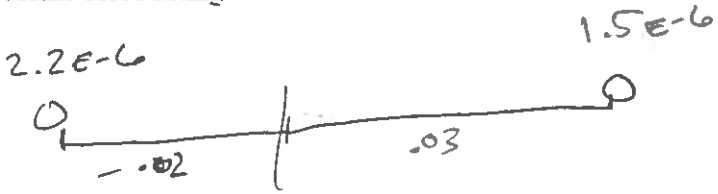
$E = \frac{kq}{r^2}$

$E_1 = \frac{9E9(18E-6)}{.05^2} = 64800000$

$E_2 = \frac{9E9(15E-6)}{.06^2} = 37500000$

$64800000 - 37500000 = 27300000$

P09. Two electric charges are placed on the x-axis as described below:
a 1.50μC charge is placed at x = 3.00cm and
a 2.20μC charge is placed at x = -2.00cm.
What is the magnitude of the Coulomb force acting on the 1.50μC charge?



A) 0.590 N
B) 11.9 N
C) 33.0 N
D) 74.3 N
E) 540 N

$F = \frac{kqq}{r^2}$

$F = \frac{9E9(2.2E-6)(1.5E-6)}{(.05)^2} = 11.9N$

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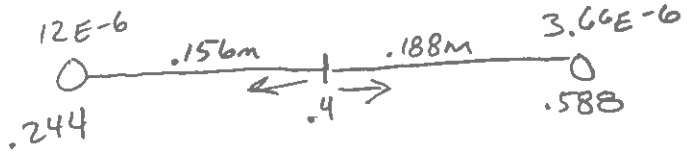
P13. A particle with a charge of 12.0 μC is located on the x-axis at x = 24.4 cm. A second particle with a charge of 3.66 μC is located on the x-axis at x = 58.8 cm. What is the magnitude of the electric field at a point on the x-axis where x = 40.0 cm?

A) 3,500,000 N/C
B) 3,710,000 N/C
C) 3,920,000 N/C
D) 4,130,000 N/C
E) 4,340,000 N/C



$E = \frac{kq}{r^2}$

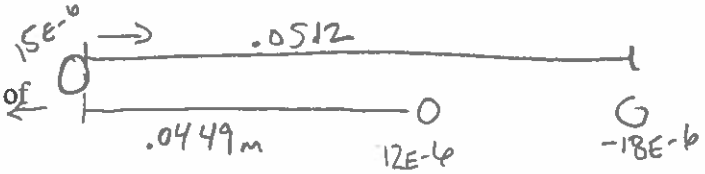
$E_1 = \frac{9E9(12E-6)}{(.156)^2} = 443786$

$E_2 = \frac{9E9(3.66E-6)}{(.188)^2} = 931982$

$931982 - 443786 = 3500000$

P13. A particle with a charge of 12.0 μC is located on the x-axis at x = 4.49 cm. A second particle with a charge of −18.0 μC is located on the x-axis at x = 5.12 cm. A third particle with a charge of 15.0 μC is located at the origin. Find the magnitude of the net electrostatic force exerted on the charged particle located at the origin.

A) 8.77 N
B) 35.2 N
C) 123 N
D) 9020 N
E) 44500 N



$F = \frac{kqq}{r^2}$

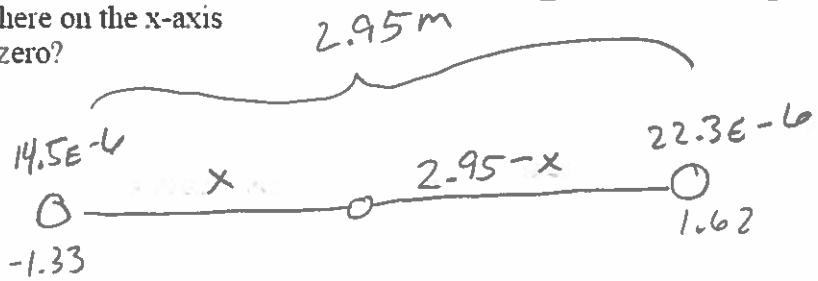
$F_1 = \frac{k(12E-6)(15E-6)}{(.0449)^2} = 803$

$F_2 = \frac{k(18E-6)(15E-6)}{(.0572)^2} = 926$

$926 - 803 = 123$

P13. A 14.5 μC charge is placed on the x-axis at $x = -1.33$ m. A 22.3 μC charge is placed on the x-axis at $x = 1.62$ m. Where on the x-axis is the electric field equal to zero?

A) $x = -.116$ m
B) $x = -.0515$ m
C) $x = -.0131$ m
D) $x = .0349$ m
E) $x = .0698$ m



$E = \frac{kq}{r^2}$

$\frac{k(14.5E-6)}{x^2} = \frac{k(22.3E-6)}{(2.95-x)^2}$

$22.3E6\,x^2 = 14.5E6(2.95-x)^2$

$22.3x^2 = 14.5(2.95-x)(2.95-x)$

$22.3x^2 = 14.5(8.7025 - 5.9x + x^2)$

$22.3x^2 = 126.18 - 85.55 + 14.5x^2$

$0 = 126.18 - 85.55 - 7.8x^2$

$7.8x^2 + 85.55x - 126.18 = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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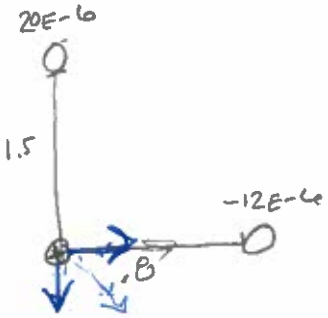
P09. Two charges are located near the origin of a coordinate system. The first charge is +20.0 μC located on the y-axis at (0, 1.50m). The second charge is −12.0 μC located on the x-axis at (0.800m, 0). What is the magnitude of the electric field at the origin caused by these two charges?

A) 0.799×10^5 N/C
B) 0.887×10^5 N/C
C) 1.69×10^5 N/C
D) 1.87×10^5 N/C
E) 2.48×10^5 N/C



$E = \frac{kq}{r^2}$

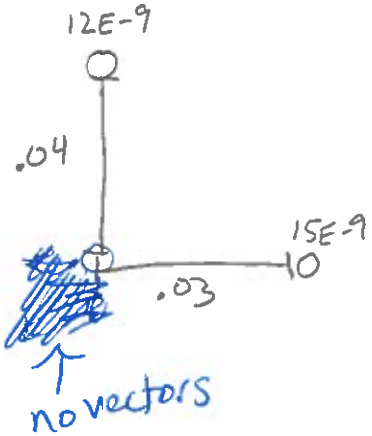
$E_1 = \frac{9E9(20E-6)}{(1.5)^2} = 80000$

$E_2 = \frac{9E9(12E-6)}{(.8)^2} = 168750$

$\sqrt{(80000)^2 + (168750)^2} = 186753$

P10. Two charges are placed near the origin of a coordinate system. A +12.0nC charge is placed on the y-axis at (0, 4.00cm). A +15nC charge is placed on the x-axis at (3.00cm, 0). What is the magnitude of the electric potential at the origin (0, 0) due to these charges? Assume $V_\infty = 0.0$ V.

A) 1800 V
B) 2700 V
C) 4500 V
D) 5250 V
E) 7200 V



$V = \frac{kq}{r}$

no vectors

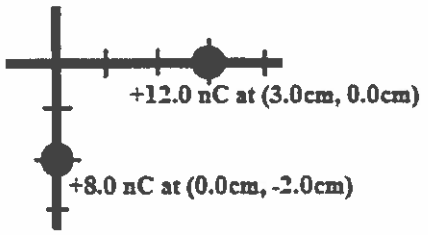
$V_1 = \frac{9E9(12E-9)}{.04} = 2700$

$V_2 = \frac{9E9(15E-9)}{.03} = 4500$

With potential just add them

$2700 + 4500 = 7200$

P13. Calculate the electric potential at the origin (0, 0) due to the charges shown.



$V_1 = \frac{K(12E-9)}{.03} = 3600$

$V_2 = \frac{K(8E-9)}{.02} = 3600$

$3600 + 3600 = 7200$

A) 0.0 V
B) 1990 V
C) 2990 V
D) 3600 V
E) 7190 V

P20. A 5.62×10^{-5} kg object has a charge of 9.66×10^{-9} C. If it is placed in a 6,000 N/C electric field and released, what will the acceleration of the object be?

A) 0.850 m/s^2
B) 1.03 m/s^2
C) 1.21 m/s^2
D) 1.39 m/s^2
E) 1.57 m/s^2

look at units and sometimes that will help

$\frac{N}{C} \cdot C = N$

$F = ma$

$F = EQ$

$EQ = ma$

$6000(9.66E-9) = 5.62E-5\ a$

$a = 1.03\ m/s^2$

$$F = \frac{kq_1q_2}{r^2}$$

$$E = \frac{kq}{r^2}$$

$$V = \frac{kq}{r}$$ (use signs of the charges)

$k = 9 \times 10^9$