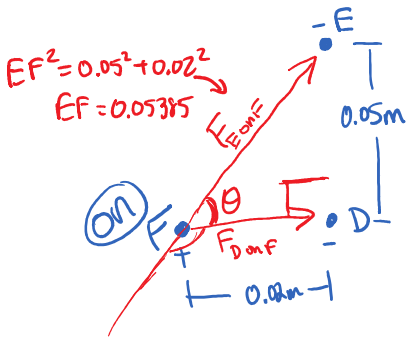
Non-90° Vector Triangle Key

(similar to test question)

Point charge D, -3.2 x 10^{-9} C, is 5.0 cm to the South of another point charge E, -4.5 x 10^{-9} C. What is the magnitude of the resultant force on point charge F, +5.2 x 10^{-9} C, which is 2.0 cm to the West of D? Sketch the situation as part of you solution.

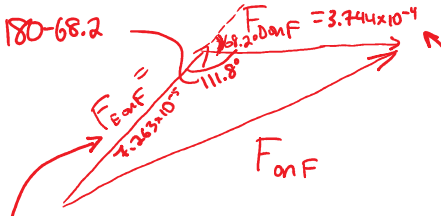


$EF^2 = 0.05^2 + 0.02^2$

$EF = 0.05385$

$\tan\theta = \frac{0.05m}{0.02m}$

$\theta = 68.20°$



$\vec{F}_{D\,on\,F} = \frac{kQ_DQ_F}{r^2}$

$= \frac{9 \times 10^9 (3.2 \times 10^{-9})(5.2 \times 10^{-9})}{(0.02m)^2}$

$= 3.744 \times 10^{-4}\ N$

$\vec{F}_{E\,on\,F} = \frac{kQ_EQ_F}{r^2}$

$= \frac{9 \times 10^9 (4.5 \times 10^{-9})(5.2 \times 10^{-9})}{(0.05385)^2}$

$= 7.263 \times 10^{-5}\ N$

Cosine Law:

$F_{on\,F}^2 = (3.744 \times 10^{-4})^2 + (7.263 \times 10^{-5})^2 - 2(3.744 \times 10^{-4})(7.263 \times 10^{-5}) \cos 111.8°$

$F_{on\,F} = 4.1 \times 10^{-4}\ N$