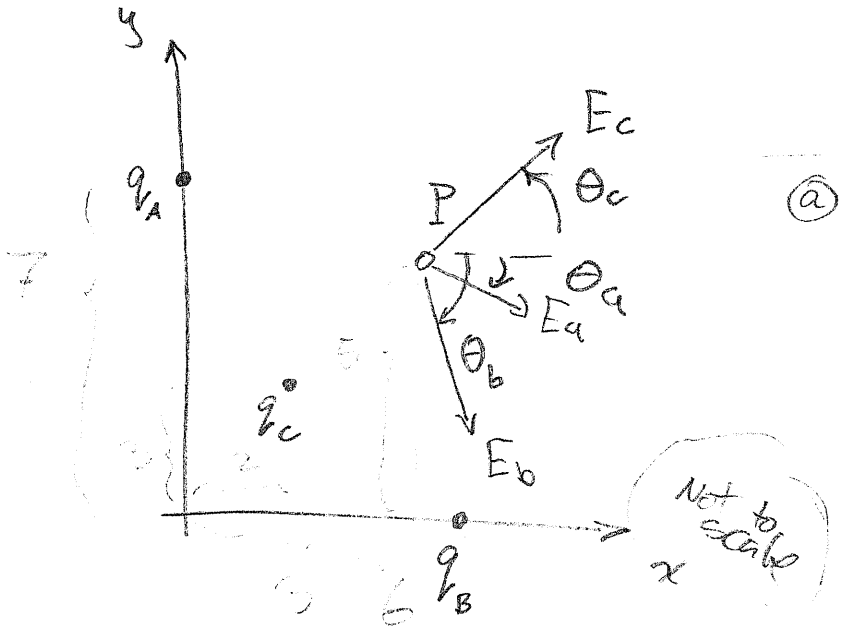
P201 WHW1 Sol'n to E field



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

(a) $r^2 = (3^2 + 2^2)m^2 = 13m^2$

$\theta_a = \text{Tan}^{-1}\left(\frac{2}{3}\right)$ below $\hat{x}$

$E_a = 4.15\frac{N}{C}$

$\theta_a = 33.7°$

$E_{ax} = E_a \cos\theta_a = 3.45\frac{N}{C}$

$E_{ay} = -E_a \sin\theta_a = -2.30\frac{N}{C}$

(b) $r^2 = (3^2 + 5^2)m^2 = 34m^2$

$\theta_b = \text{Tan}^{-1}\left(\frac{5}{3}\right) = 59°$

$E_b = \frac{9\times10^9 \; 4.5\times10^{-9}}{34}\frac{N}{C} = 1.19\frac{N}{C}$

$E_{by} = -1.02\ N/C$

$E_{bx} = 0.613\ N/C$

(c) $r^2 = (1^2 + 2^2)m^2 = 5m^2$

$\theta_c = \text{Tan}^{-1}\left(\frac{2}{1}\right) = 63.4°$

$E_c = \frac{9\times10^9 \; 2\times10^{-9}}{5} = 3.6\frac{N}{C}$

$E_{cx} = 1.61\ N/C$

$E_{cy} = 3.22\ N/C$

Sum all $\vec{E}$:

$E_x = 5.67\frac{N}{C}$

$E_y = -0.10\frac{N}{C}$

RECTANGULAR

$E \simeq 5.67$

$\theta \simeq \text{Tan}^{-1}\left(\frac{-0.10}{5.67}\right)$

$\theta = -1°$

almost purely along $\hat{x}$ direction.

POLAR

$\vec{E} = \left(5.67\frac{N}{C}, -1°\right)$