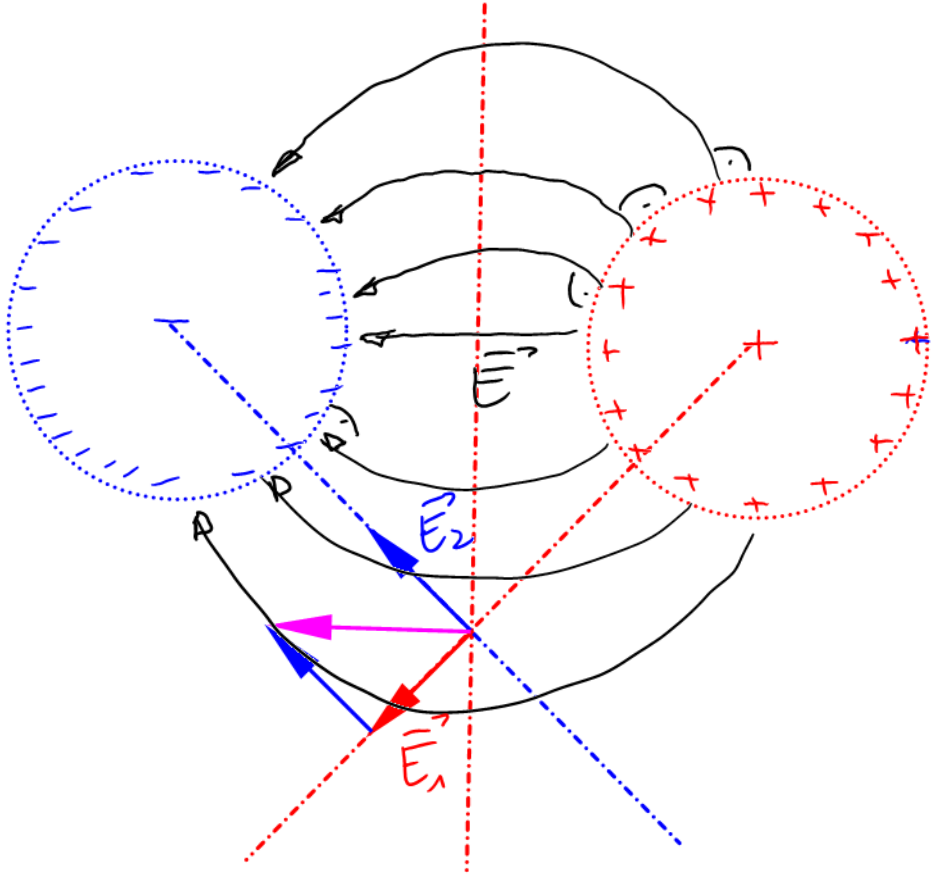
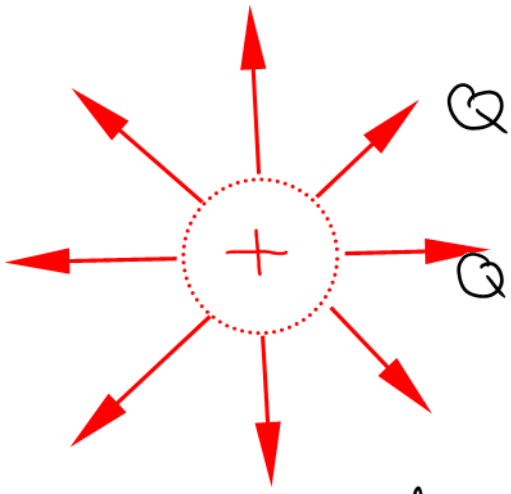


$$\underline{\underline{Q}}^{+} = \int \vec{D}\, d\vec{A} = \int \varepsilon \cdot \vec{E}\, d\vec{A}$$

Point charge



$$Q = \varepsilon E \left[\int d\vec{A}\right] \rightarrow \text{Sphere} \quad 4\pi r^2$$

$$Q = 4\pi\varepsilon \cdot E \cdot r^2 \rightarrow \vec{E} = \frac{Q}{4\pi\varepsilon \cdot r^2}\, \vec{e}_r$$

$r_\infty \rightarrow U_{r\to\infty} \Rightarrow 0V$

$$U = -\int_{r_\infty}^{r_1} E\, ds = \int_{r_1}^{r_\infty} E\, ds = \frac{Q}{4\pi\varepsilon} \cdot \frac{1}{r_1}$$

$$\frac{U}{Q} = \frac{1}{C} \Rightarrow C = \frac{Q}{U} = 4\pi\varepsilon \cdot r_1$$

$$\boxed{Q = CU}$$

$$\varepsilon = \varepsilon_0 \cdot \varepsilon_r$$

$$E_1^+ = \frac{Q}{4\pi\varepsilon} \cdot \frac{1}{r_1} = \frac{Q}{4\pi\varepsilon} \cdot \frac{1}{\sqrt{x^2 + y^2}}$$

y upshift

$$\sqrt{(x-x_0)^2 + (y-y_0)^2}$$

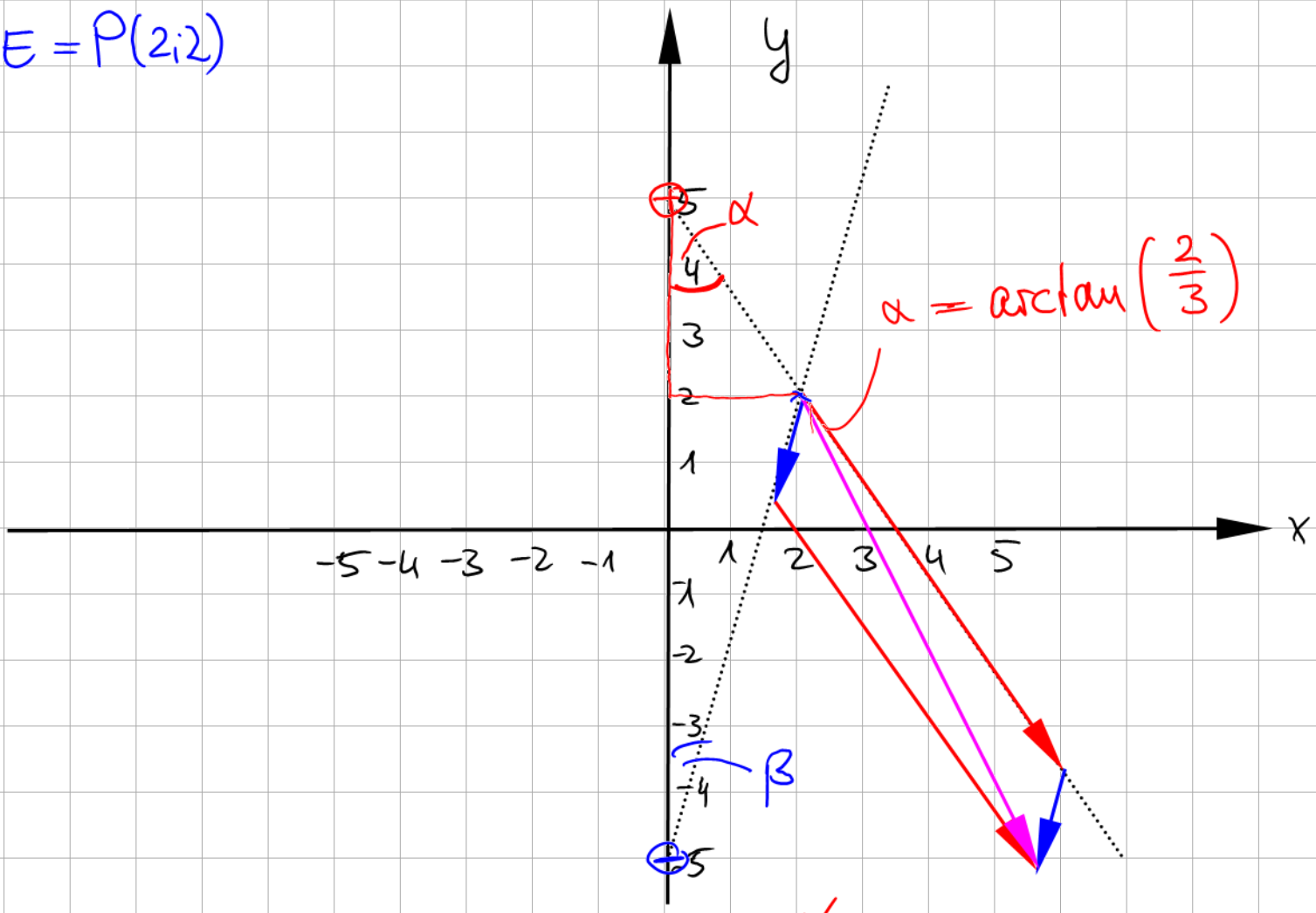
$$E_2^- = \frac{Q^-}{4\pi\varepsilon} \cdot \frac{1}{r_2} = \frac{Q^-}{4\pi\varepsilon} \cdot \frac{1}{\sqrt{(x-x_0)^2 + (y+y_0)^2}}$$

down shifted

$Q^+ = 10\,nC \quad ; \quad Q^- = -10\,nC$

$h = 5\,m$

$E = P(2;2)$



$$\vec{E_1} = \frac{Q}{4\pi\varepsilon \cdot r^2} = \frac{10\,nAs}{4\pi\, 8{,}85\,pAs/Vm \cdot (\sqrt{2^2+3^2})^2\,m^2} = 6{,}9\ \frac{V}{m}$$

$$\vec{E_2} = \frac{Q}{4\pi\varepsilon \cdot r^2} = \frac{10\,nAs}{4\pi\, 8{,}85\,pAs/Vm \cdot \sqrt{7^2+2^2}\,m^2} = 1{,}7\ \frac{V}{m}$$

$$\vec{E_1} = \begin{pmatrix} E_{1x} \\ E_{1y} \end{pmatrix} = \begin{vmatrix} \cos\alpha\,|E_1| \\ \sin\alpha\,(\vec{E_1}) \end{vmatrix} = \begin{pmatrix} 3{,}83 \\ -5{,}75 \end{pmatrix} \frac{V}{m}$$

$$\vec{E_2} = \begin{pmatrix} E_{2x} \\ E_{2y} \end{pmatrix} = \begin{vmatrix} \cos\beta\,(E_2) \\ \sin\beta\,(E_2) \end{vmatrix} = \begin{pmatrix} -0{,}47 \\ -1{,}63 \end{pmatrix} \frac{V}{m}$$

$$\vec{E_{res}} = \vec{E_1} + \vec{E_2} = \begin{pmatrix} 3{,}37 \\ -7{,}38 \end{pmatrix} \frac{V}{m} \qquad |\vec{E_{res}}| = 8{,}108\ \frac{V}{m}$$