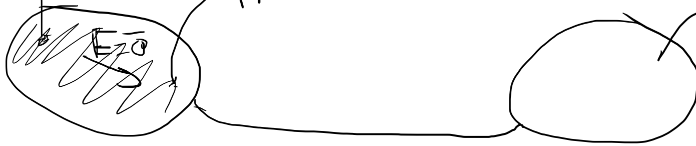
9

φ_1 φ_1 φ_1 $E=0$



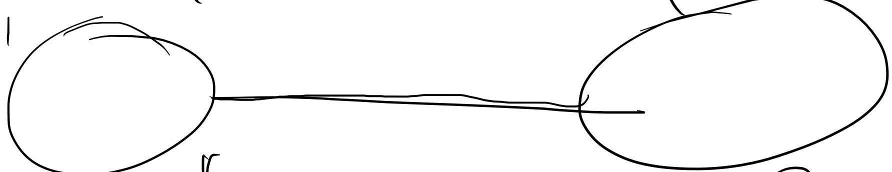
I

$\varphi_1 = \frac{kq_1}{r_1}$ $\qquad$ $\varphi_2 = \frac{kq_2}{r_2}$

q_1 r $\qquad$ r_2 q_2

II

q_1^* φ^* $\qquad$ φ^* q_2^*



r_1 $\qquad$ r_2

$\varphi^* = \frac{kq_1^*}{r_1} = \frac{kq_2^*}{r_2}$ $\qquad$ $Q = q_1 + q_2$

$$\begin{cases} q_1^* + q_2^* = q_1 + q_2 \\ \dfrac{\cancel{k} q_1^*}{r_1} = \dfrac{k q_2^*}{r_2} \end{cases} \rightarrow r_2 q_1^* = r_1 q_2^*$$

$$q_1^* = ?$$

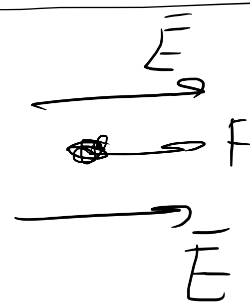
$$q_2^* = ?$$

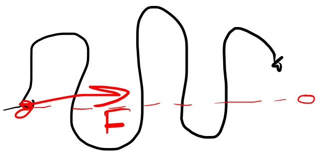
$$q_1^* - q_1 = \Delta q$$

5

$U = 600\,kV$ $\quad m = ?$

$q = 2e$ $\quad \Delta v = 5400\,km/s$





$A = (\bar{F}; \bar{S})$

$U = (\bar{E}; \bar{S})$

$\frac{A}{q} = U \qquad A = Uq \qquad \boxed{Uq = (\bar{F}; \bar{S})}$

$\Delta v =$

$a = \frac{\Delta v}{\Delta t}$

$a =$ $\boxed{S = \frac{v^2 - v_0^2}{2a}}$

$a \quad S_0 = 0 \quad v_0 = 0$

$S = S_0 + vt + \frac{at^2}{2}$

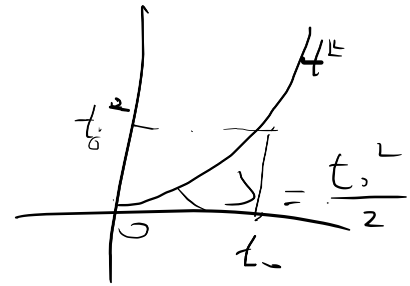
τ

$v(t) = at$

$S = \frac{a\tau^2}{2}$ $\rightarrow$ $\boxed{S = \frac{v^2}{2a}}$

$v = a\tau \rightarrow \tau = \frac{v}{a}$

$$\int at\,dt = a\int t\,dt$$



$$\int at\,d(at) \neq a\int t\,d(at)$$

$$\int at\,da = t\int a\,da = \frac{ta^2}{2}$$

$$U_q = (\bar{F} \cdot \bar{S}) ; \qquad \bar{S} = \frac{\bar{v}^2}{2a} \qquad a = \frac{F}{m}$$

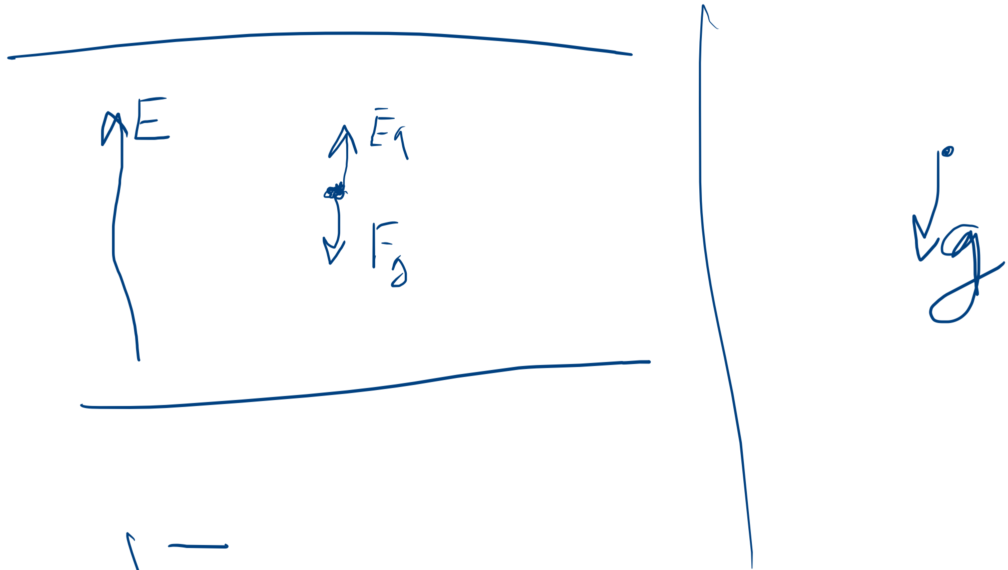
$$U_q = \left(\bar{F} \cdot \frac{\bar{v}^2 m}{2\bar{F}} \right) = \frac{\cancel{F} \cdot v^2 m}{2\cancel{F}}$$

$$U_q = \frac{mv^2}{2} ; \qquad A = \Delta k = \frac{m(\Delta v)^2}{2}$$

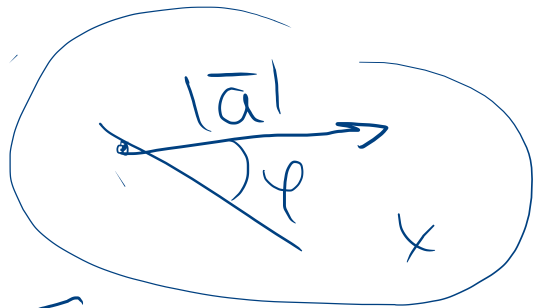
$$\boxed{m = \frac{2U_q}{(\Delta v)^2}}$$

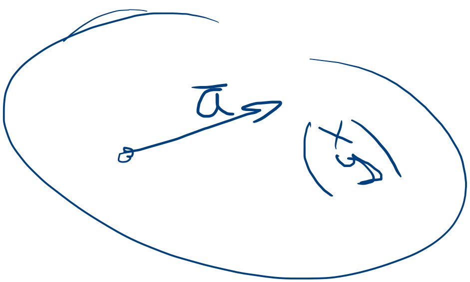
7

$u = |E|d$



$\alpha \in (-\infty ; +\infty)$. $\alpha \in \mathbb{R}$

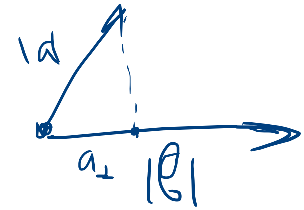




$|a| = \sqrt{x^2 + y^2}$

$\mathrm{tg}\,\alpha = \frac{x}{y}$

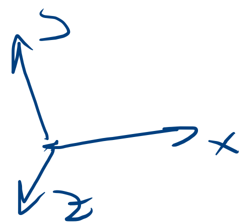
$\bar{a} = \alpha \bar{b}$ $\quad$ $u = (\bar{F}; \bar{s})$



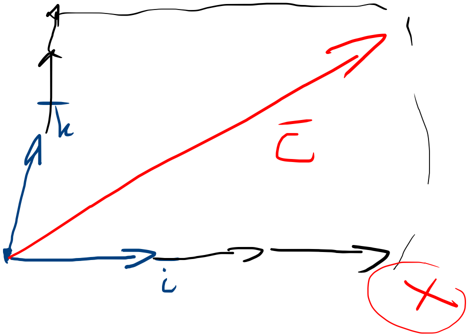
$a_\perp \cdot |b| \in \mathbb{R}$

$$\bar{a} = \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2$$

$$\bar{a} = \begin{pmatrix} x \\ y \\ z \end{pmatrix} \in \mathbb{R}^3$$



$$\bar{a} = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \\ a_n \end{pmatrix} \qquad \bar{r} = \begin{pmatrix} r_x \\ r_y \\ r_z \end{pmatrix}$$



$\bar{c} = 3\bar{i} + 3\bar{k} = x\bar{i} + y\bar{j}$

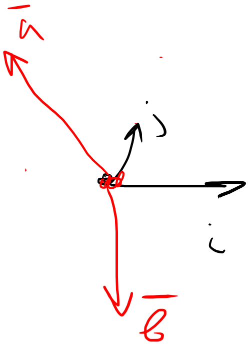
$\bar{i}, \bar{j}, O. - c.h.$

$\bar{a} + \bar{b} = (a_x\bar{i} + a_y\bar{j} + b_x\bar{i} + b_y\bar{j}) =$

$= (a_x + b_x)\bar{i} + (a_y + b_y)\bar{j} =$

$\bar{a} + \bar{b} = (a_x + b_x)\bar{i} + (b_y + a_y)\bar{j}$

$\bar{a} = \begin{pmatrix} a_x \\ a_y \end{pmatrix} \quad \bar{b} = \begin{pmatrix} b_x \\ b_y \end{pmatrix} \quad \bar{a} + \bar{b} = ($



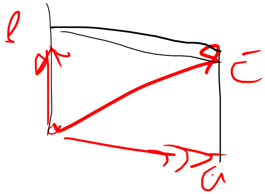
$$\bar a = a_x \cdot \bar i + a_y \vec j$$

$$\bar b = b_x \vec i + b_y \bar j$$

$$\bar a + \bar b = (a_x \bar i + b_x \bar i) + (b_y \bar j + a_y \bar j) =$$

$$= (a_x + b_x)\bar i + (b_y + a_y)\bar j$$

$$\bar a = \begin{pmatrix} a_x \\ a_y \end{pmatrix} \quad \bar b = \begin{pmatrix} b_x \\ b_y \end{pmatrix} \qquad \bar a + \bar b = \begin{pmatrix} a_x + b_x \\ a_y + b_y \end{pmatrix}$$



$$\alpha\bar{a}+\beta\bar{b}=\bar{c}$$

$$\beta\bar{a}+\alpha\bar{b}\neq\bar{c}$$

Если | i | = 1 и | j | = 1 образуют угол 90 градусов, то такая система называется декартова прямоугольная

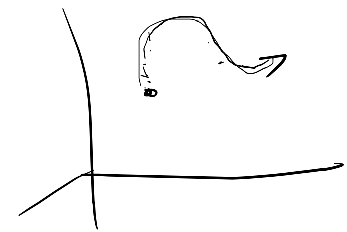
Тогда и только тогда $\bar{a} = \begin{pmatrix} a_x \\ a_y \end{pmatrix}$ $\bar{b} = \begin{pmatrix} b_x \\ b_y \end{pmatrix}$

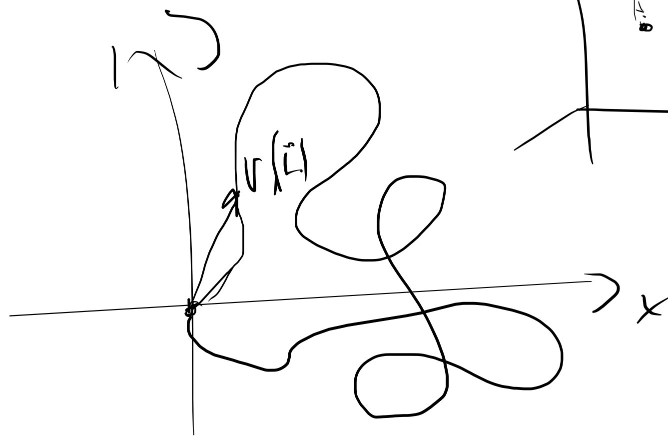
$$\bar{a} \cdot \bar{b} = a_x \cdot b_x + a_y \cdot b_y$$

$$\bar{a} = \begin{pmatrix} 1 \\ 2 \\ 12 \\ -4 \end{pmatrix} \qquad \bar{r} = \begin{pmatrix} r_x \\ r_y \\ r_z \\ t \end{pmatrix}$$

$x(t)$

$\bar{r}(t)$





$$x = \begin{pmatrix} r_{x1} \\ r_s \end{pmatrix}$$

$$\begin{pmatrix} \vec{r} \\ t \end{pmatrix}$$

Now