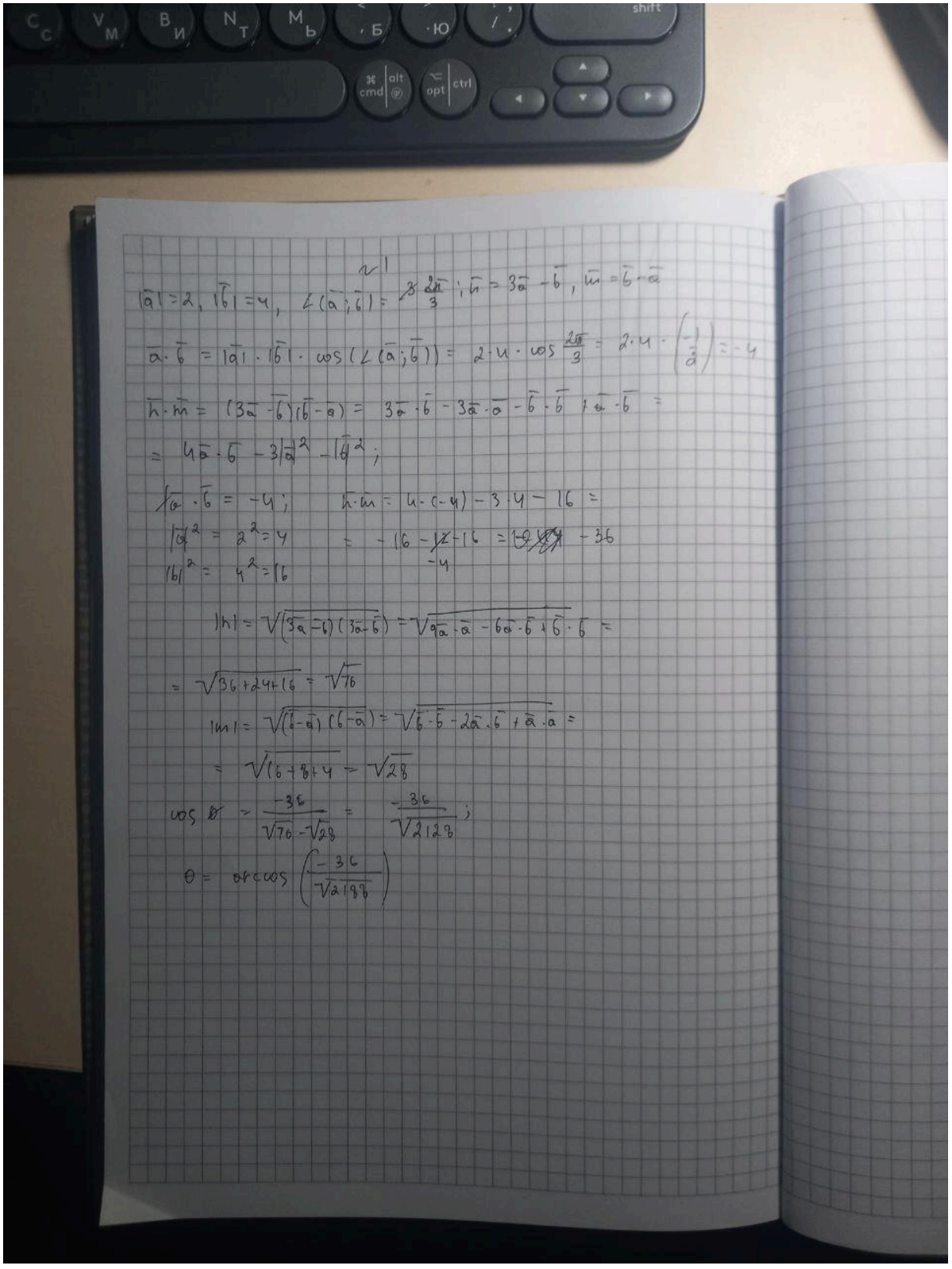
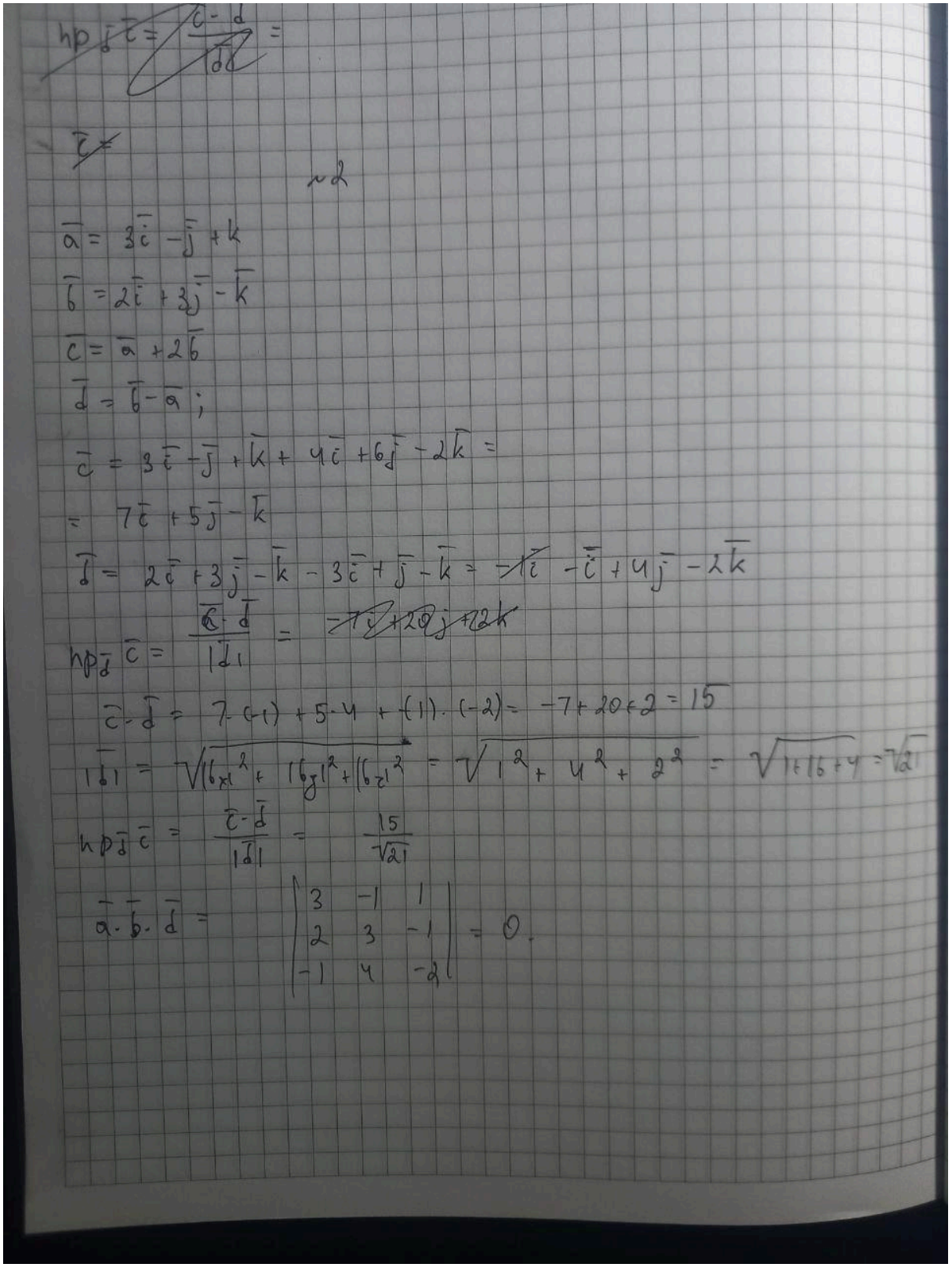
№1


$|\bar{a}|=2,\ |\bar{b}|=4,\ \angle(\bar{a};\bar{b})=\frac{2\pi}{3};\ \bar{h}=3\bar{a}-\bar{b},\ \bar{m}=\bar{b}-\bar{a}$
$\bar{a}\cdot\bar{b}=|\bar{a}|\cdot|\bar{b}|\cdot\cos(\angle(\bar{a};\bar{b}))=2\cdot4\cdot\cos\frac{2\pi}{3}=2\cdot4\cdot\left(-\frac{1}{2}\right)=-4$
$\bar{h}\cdot\bar{m}=(3\bar{a}-\bar{b})(\bar{b}-\bar{a})=3\bar{a}\cdot\bar{b}-3\bar{a}\cdot\bar{a}-\bar{b}\cdot\bar{b}+\bar{a}\cdot\bar{b}=$
$=4\bar{a}\cdot\bar{b}-3|\bar{a}|^2-|\bar{b}|^2;$
$\bar{a}\cdot\bar{b}=-4;$
$|\bar{a}|^2=2^2=4$
$|\bar{b}|^2=4^2=16$
$\bar{h}\cdot\bar{m}=4\cdot(-4)-3\cdot4-16=$
$=-16-12-16=-36$
$|\bar{h}|=\sqrt{(3\bar{a}-\bar{b})(3\bar{a}-\bar{b})}=\sqrt{9\bar{a}\cdot\bar{a}-6\bar{a}\cdot\bar{b}+\bar{b}\cdot\bar{b}}=$
$=\sqrt{36+24+16}=\sqrt{76}$
$|\bar{m}|=\sqrt{(\bar{b}-\bar{a})(\bar{b}-\bar{a})}=\sqrt{\bar{b}\cdot\bar{b}-2\bar{a}\cdot\bar{b}+\bar{a}\cdot\bar{a}}=$
$=\sqrt{16+8+4}=\sqrt{28}$
$\cos\theta=\frac{-36}{\sqrt{76}\cdot\sqrt{28}}=\frac{-36}{\sqrt{2128}};$
$\theta=\arccos\left(\frac{-36}{\sqrt{2128}}\right)$

№2



$\text{пр}_{\bar{d}}\bar{c} = \frac{\bar{c}\cdot\bar{d}}{|\bar{d}|} =$

$\bar{c} =$

№2

$\bar{a} = 3\bar{i} - \bar{j} + \bar{k}$

$\bar{b} = 2\bar{i} + 3\bar{j} - \bar{k}$

$\bar{c} = \bar{a} + 2\bar{b}$

$\bar{d} = \bar{b} - \bar{a};$

$\bar{c} = 3\bar{i} - \bar{j} + \bar{k} + 4\bar{i} + 6\bar{j} - 2\bar{k} =$

$= 7\bar{i} + 5\bar{j} - \bar{k}$

$\bar{d} = 2\bar{i} + 3\bar{j} - \bar{k} - 3\bar{i} + \bar{j} - \bar{k} = -\bar{i} + 4\bar{j} - 2\bar{k}$

$\text{пр}_{\bar{d}}\bar{c} = \frac{\bar{c}\cdot\bar{d}}{|\bar{d}|} =$

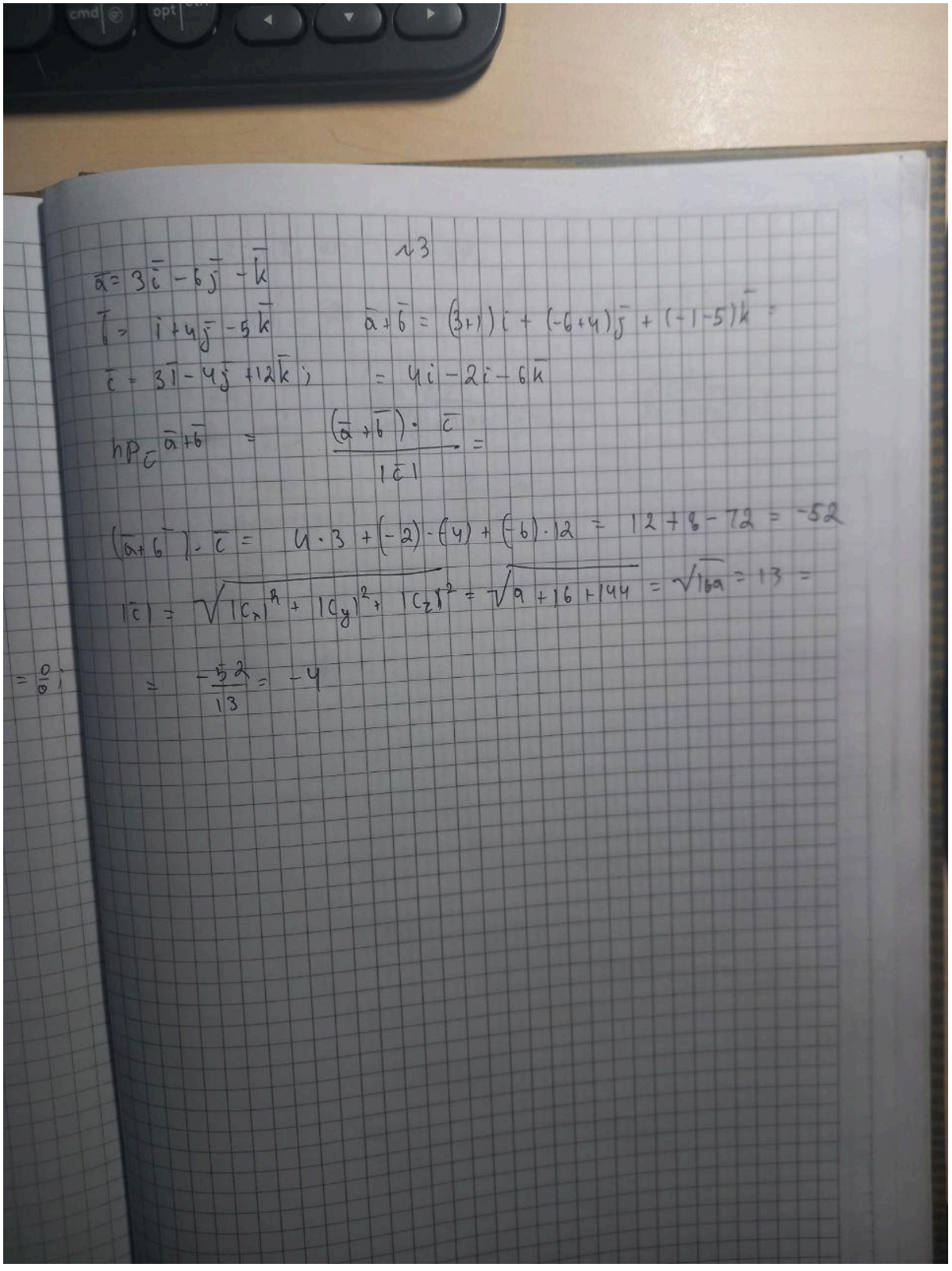
$\bar{c}\cdot\bar{d} = 7\cdot(-1) + 5\cdot 4 + (-1)\cdot(-2) = -7 + 20 + 2 = 15$

$|\bar{d}| = \sqrt{(6_{x1})^2 + (6_{y1})^2 + (6_{z1})^2} = \sqrt{1^2 + 4^2 + 2^2} = \sqrt{1+16+4} = \sqrt{21}$

$\text{пр}_{\bar{d}}\bar{c} = \frac{\bar{c}\cdot\bar{d}}{|\bar{d}|} = \frac{15}{\sqrt{21}}$

$\bar{a}\cdot\bar{b}\cdot\bar{d} = \begin{vmatrix} 3 & -1 & 1 \\ 2 & 3 & -1 \\ -1 & 4 & -2 \end{vmatrix} = 0.$

№3



№3

$\bar{a} = 3\bar{i} - 6\bar{j} - \bar{k}$

$\bar{b} = \bar{i} + 4\bar{j} - 5\bar{k}$

$\bar{c} = 3\bar{i} - 4\bar{j} + 12\bar{k}$;

$\bar{a} + \bar{b} = (3+1)\bar{i} + (-6+4)\bar{j} + (-1-5)\bar{k} =$

$= 4\bar{i} - 2\bar{i} - 6\bar{k}$

$np_{\bar{c}}^{\bar{a}+\bar{b}} = \dfrac{(\bar{a}+\bar{b})\cdot\bar{c}}{|\bar{c}|} =$

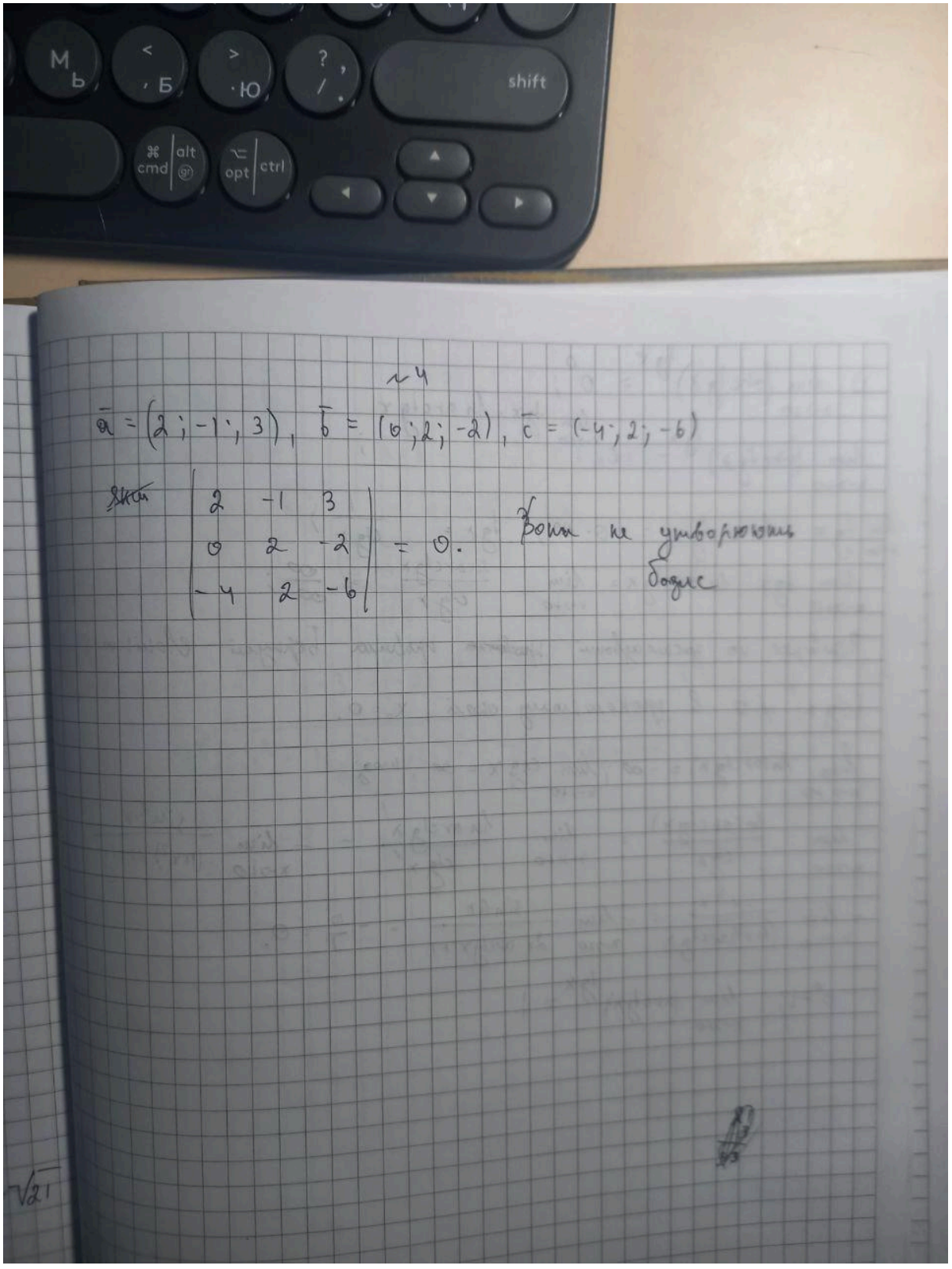
$(\bar{a}+\bar{b})\cdot\bar{c} = 4\cdot 3 + (-2)\cdot(-4) + (-6)\cdot 12 = 12 + 8 - 72 = -52$

$|\bar{c}| = \sqrt{|c_x|^2 + |c_y|^2 + |c_z|^2} = \sqrt{9 + 16 + 144} = \sqrt{169} = 13 =$

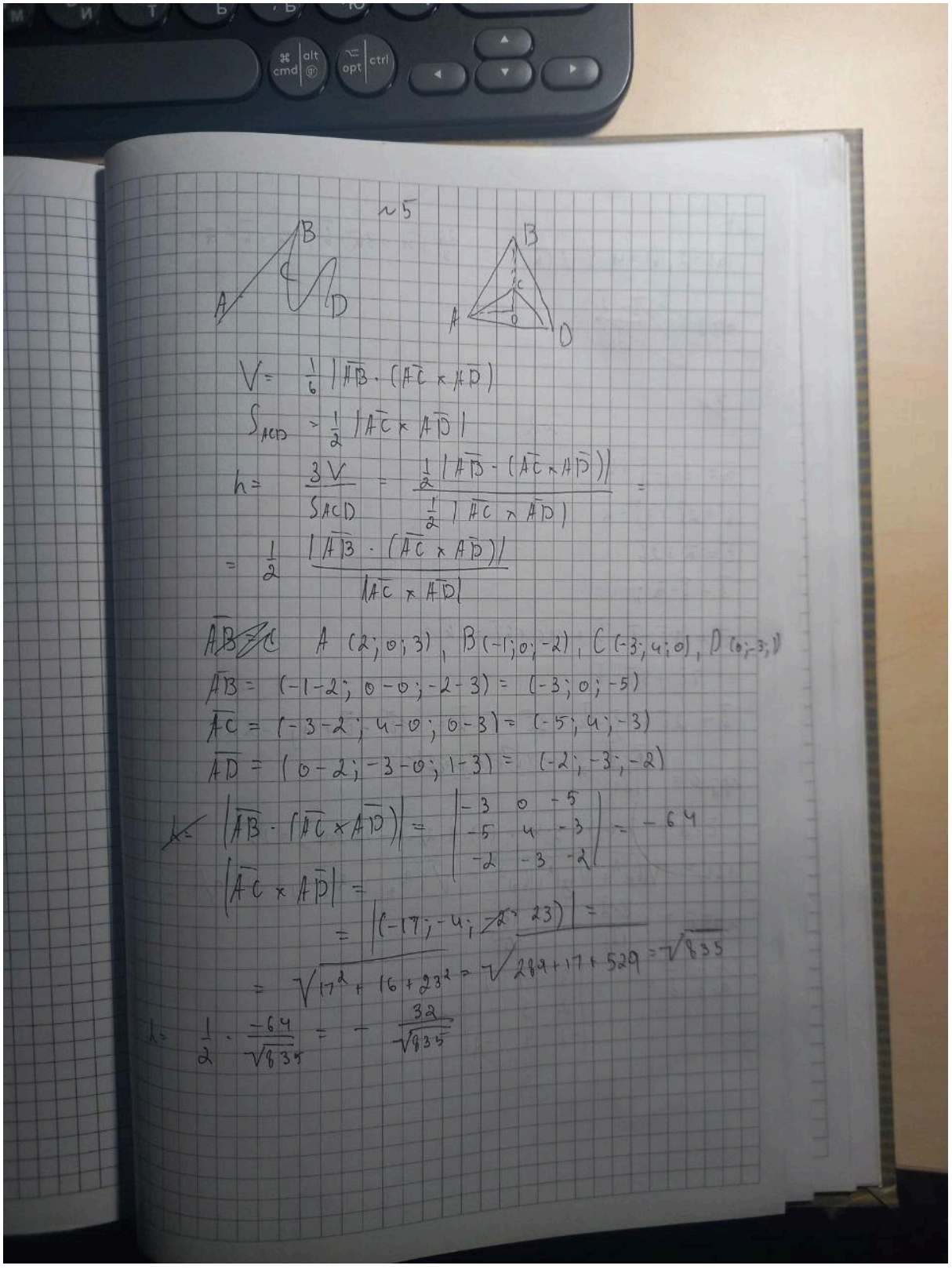
$= \dfrac{0}{0};$

$= \dfrac{-52}{13} = -4$

№4


№4
$\bar{a} = (2; -1; 3)$, $\bar{b} = (0; 2; -2)$, $\bar{c} = (-4; 2; -6)$
$\begin{vmatrix} 2 & -1 & 3 \\ 0 & 2 & -2 \\ -4 & 2 & -6 \end{vmatrix} = 0.$
Векторы не удовлетворяют базису

№5



$$V = \frac{1}{6}|\bar{AB}\cdot(\bar{AC}\times\bar{AD})|$$

$$S_{ACD} = \frac{1}{2}|\bar{AC}\times\bar{AD}|$$

$$h = \frac{3V}{S_{ACD}} = \frac{\frac{1}{2}|\bar{AB}\cdot(\bar{AC}\times\bar{AD})|}{\frac{1}{2}|\bar{AC}\times\bar{AD}|} =$$

$$= \frac{1}{2}\cdot\frac{|\bar{AB}\cdot(\bar{AC}\times\bar{AD})|}{|\bar{AC}\times\bar{AD}|}$$

$A(2;0;3)$, $B(-1;0;-2)$, $C(-3;4;0)$, $D(0;-3;1)$

$\bar{AB} = (-1-2;\ 0-0;\ -2-3) = (-3;0;-5)$

$\bar{AC} = (-3-2;\ 4-0;\ 0-3) = (-5;4;-3)$

$\bar{AD} = (0-2;\ -3-0;\ 1-3) = (-2;-3;-2)$

$$|\bar{AB}\cdot(\bar{AC}\times\bar{AD})| = \begin{vmatrix} -3 & 0 & -5 \\ -5 & 4 & -3 \\ -2 & -3 & -2 \end{vmatrix} = -64$$

$$|\bar{AC}\times\bar{AD}| = |(-17;-4;-23)| = \sqrt{17^2+16+23^2} = \sqrt{289+17+529} = \sqrt{835}$$

$$h = \frac{1}{2}\cdot\frac{-64}{\sqrt{835}} = -\frac{32}{\sqrt{835}}$$