Seminari 3

Matematičke metode za informatičare

Damir Horvat

FOI, Varaždin

Sadržaj

Ponavljanje teorije

prvi zadatak

drugi zadatak

treći zadatak

četvrti zadatak

Koordinate djelišne točke

Parametrizacija dužine i pravca

Ponavljanje teorije

$$ec{a}\,ec{b} = |ec{a}|\cdot|ec{b}|\cdot\cos\left(ec{a},ec{b}\,
ight)$$

$$\vec{a}\,\vec{b} = |\vec{a}|\cdot|\vec{b}|\cdot\cos{(\vec{a},\vec{b}\,)}$$

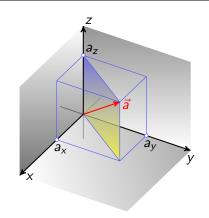
$$\vec{a} = (a_x, a_y, a_z)$$

$$ec{a}\,ec{b} = ert ec{a} ert \cdot ert ec{b} ert \cdot \cos{(ec{a},ec{b})}$$

$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

$$\vec{a}\,\vec{b} = |\vec{a}|\cdot|\vec{b}|\cdot\cos\left(\vec{a},\vec{b}\,\right)$$

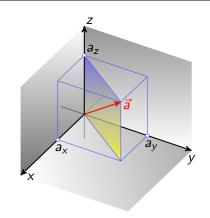
$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$



$$\vec{a}\,\vec{b} = |\vec{a}|\cdot|\vec{b}|\cdot\cos\left(\vec{a},\vec{b}\,\right)$$

$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

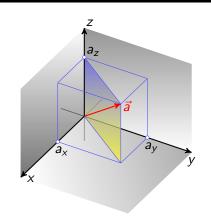
$$\vec{b} = (b_x, b_y, b_z)$$



$$\vec{a}\,\vec{b} = |\vec{a}|\cdot|\vec{b}|\cdot\cos\left(\vec{a},\vec{b}\,\right)$$

$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

 $\vec{b} = (b_x, b_y, b_z) = b_x \vec{i} + b_y \vec{j} + b_z \vec{k}$

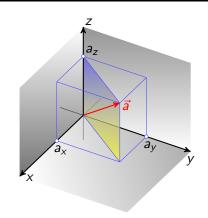


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$$\vec{a}\,\vec{b}=a_xb_x+a_yb_y+a_zb_z$$



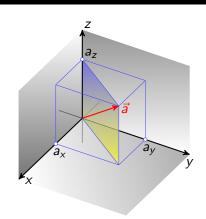
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$$\vec{a}\,\vec{b}=a_xb_x+a_yb_y+a_zb_z$$

$$|\vec{a}| = \sqrt{a_x^2 + a_y^2 + a_z^2}$$



$$\vec{a}\,\vec{b} = |\vec{a}|\cdot|\vec{b}|\cdot\cos\left(\vec{a},\vec{b}\,\right)$$

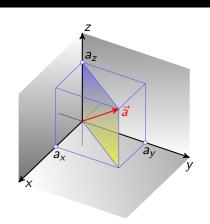
$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

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$$\operatorname{pr}_{\vec{a}} \vec{b} = rac{\vec{a} \, \vec{b}}{|\vec{a}|^2} \cdot \vec{a}$$

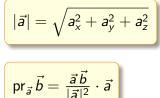


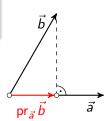
$$\vec{a} \, \vec{b} = |\vec{a}| \cdot |\vec{b}| \cdot \cos(\vec{a}, \vec{b})$$

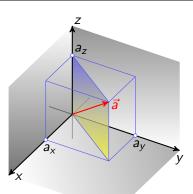
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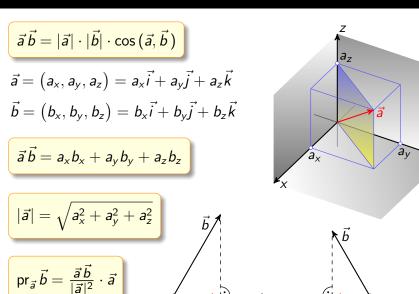
 $\vec{b} = (b_x, b_y, b_z) = b_x \vec{i} + b_y \vec{j} + b_z \vec{k}$

$$\vec{a}\,\vec{b} = a_x b_x + a_y b_y + a_z b_z$$









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$$\overrightarrow{BE} \cdot \overrightarrow{BA} = -1$$

$$|AB| = 5, |AD| = 3, \langle DAB = 60^{\circ}$$

$$|AE| = \frac{4}{5}|AC| \xrightarrow{\text{www}} \overrightarrow{AE} = \frac{4}{5}\overrightarrow{AC}$$

$$Zadana \ baza: \mathcal{B} = (\overrightarrow{AB}, \overrightarrow{AD})$$

$$\overrightarrow{BE} = -\frac{1}{5}\overrightarrow{AB} + \frac{4}{5}\overrightarrow{AD} \qquad \overrightarrow{AB} \cdot \overrightarrow{AD} = \frac{15}{2}$$

(b)
$$\overrightarrow{BE} \cdot \overrightarrow{BA} = \left(-\frac{1}{5}\overrightarrow{AB} + \frac{4}{5}\overrightarrow{AD} \right) \cdot \left(-\overrightarrow{AB} \right) = \frac{1}{5}\overrightarrow{AB}^2 - \frac{4}{5}\overrightarrow{AB} \cdot \overrightarrow{AD} =$$
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$$\overrightarrow{BE} \cdot \overrightarrow{BA} = \left(-\frac{1}{5}, \frac{4}{5} \right) \cdot (-1, 0) = -\frac{1}{5} \cdot (-1) + \frac{4}{5} \cdot 0$$

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$$BE \cdot BA = \left(-\frac{1}{5}AB + \frac{1}{5}AD\right) \cdot \left(-AB\right) = \frac{1}{5}AB^{2} - \frac{1}{5}AB$$
$$= \frac{1}{5}\left|\overrightarrow{AB}\right|^{2} - \frac{4}{5}\overrightarrow{AB} \cdot \overrightarrow{AD} = \frac{1}{5} \cdot 5^{2} - \frac{4}{5} \cdot \frac{15}{2} = -1$$

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$$\overrightarrow{BE} \cdot \overrightarrow{BA} = \left(-\frac{1}{5}\overrightarrow{AB} + \frac{4}{5}\overrightarrow{AD}\right) \cdot \left(-\overrightarrow{AB}\right) = \frac{1}{5}\overrightarrow{AB}^2 - \frac{4}{5}\overrightarrow{AB} \cdot \overrightarrow{AD} =$$

$$= \frac{1}{5}|\overrightarrow{AB}|^2 - \frac{4}{5}\overrightarrow{AB} \cdot \overrightarrow{AD} = \frac{1}{5} \cdot 5^2 - \frac{4}{5} \cdot \frac{15}{2} = -1$$
Ups!

 $\overrightarrow{BE} \cdot \overrightarrow{BA} = \left(-\frac{1}{5}, \frac{4}{5}\right) \cdot (-1, 0) = -\frac{1}{5} \cdot (-1) + \frac{4}{5} \cdot 0 = \frac{1}{5}$

$$\overrightarrow{BE} \cdot \overrightarrow{BA} = -1 \qquad |AB| = 5, \ |AD| = 3, \ \triangleleft DAB = 60^{\circ}$$

$$|AE| = \frac{4}{5}|AC| \xrightarrow{\text{www}} \overrightarrow{AE} = \frac{4}{5}\overrightarrow{AC}$$

$$\overrightarrow{Zadana \ baza:} \ \mathcal{B} = (\overrightarrow{AB}, \overrightarrow{AD})$$

$$\overrightarrow{BE} = -\frac{1}{5}\overrightarrow{AB} + \frac{4}{5}\overrightarrow{AD} \qquad \overrightarrow{AB} \cdot \overrightarrow{AD} = \frac{15}{2}$$

$$\overrightarrow{BA} = -1 \cdot \overrightarrow{AB} + 0 \cdot \overrightarrow{AD}$$
b)
$$\overrightarrow{BE} \cdot \overrightarrow{BA} = \left(-\frac{1}{5}\overrightarrow{AB} + \frac{4}{5}\overrightarrow{AD}\right) \cdot \left(-\overrightarrow{AB}\right) = \frac{1}{5}\overrightarrow{AB}^2 - \frac{4}{5}\overrightarrow{AB} \cdot \overrightarrow{AD} =$$

$$= \frac{1}{5}|\overrightarrow{AB}|^2 - \frac{4}{5}\overrightarrow{AB} \cdot \overrightarrow{AD} = \frac{1}{5} \cdot 5^2 - \frac{4}{5} \cdot \frac{15}{2} = -1$$
Ups!

 $\overrightarrow{BE} \cdot \overrightarrow{BA} = \left(-\frac{1}{5}, \frac{4}{5}\right) \cdot \left(-1, 0\right) = -\frac{1}{5} \cdot \left(-1\right) + \frac{4}{5} \cdot 0 = \frac{1}{5}$

$$\overrightarrow{BE} \cdot \overrightarrow{BA} = -1 \qquad |AB| = 5, \ |AD| = 3, \ \triangleleft DAB = 60^{\circ}$$

$$|AE| = \frac{4}{5}|AC| \xrightarrow{\text{Avery }} \overrightarrow{AE} = \frac{4}{5}\overrightarrow{AC}$$

$$\overrightarrow{Zadana baza}: \ \mathcal{B} = (\overrightarrow{AB}, \overrightarrow{AD})$$

$$\overrightarrow{BE} = -\frac{1}{5}\overrightarrow{AB} + \frac{4}{5}\overrightarrow{AD} \qquad \overrightarrow{AB} \cdot \overrightarrow{AD} = \frac{15}{2}$$

$$\overrightarrow{BBA} = -1 \cdot \overrightarrow{AB} + 0 \cdot \overrightarrow{AD}$$
b)
$$\overrightarrow{BE} \cdot \overrightarrow{BA} = \left(-\frac{1}{5}\overrightarrow{AB} + \frac{4}{5}\overrightarrow{AD}\right) \cdot \left(-\overrightarrow{AB}\right) = \frac{1}{5}\overrightarrow{AB}^2 - \frac{4}{5}\overrightarrow{AB} \cdot \overrightarrow{AD} =$$

$$= \frac{1}{5}|\overrightarrow{AB}|^2 - \frac{4}{5}\overrightarrow{AB} \cdot \overrightarrow{AD} = \frac{1}{5} \cdot 5^2 - \frac{4}{5} \cdot \frac{15}{2} = -1$$

$$\text{Ups!}$$

Baza \mathcal{B} nije ortonormirana!

 $\overrightarrow{BE} \cdot \overrightarrow{BA} = \left(-\frac{1}{5}, \frac{4}{5}\right) \cdot \left(-1, 0\right) = -\frac{1}{5} \cdot \left(-1\right) + \frac{4}{5} \cdot 0 = \frac{1}{5}$

$$\left| \vec{a} \times \vec{b} \right| = \left| \vec{a} \right| \cdot \left| \vec{b} \right| \cdot \sin \left(\vec{a}, \vec{b} \right)$$

$$\left| \vec{a} \times \vec{b} \right| = \left| \vec{a} \right| \cdot \left| \vec{b} \right| \cdot \sin \left(\vec{a}, \vec{b} \right)$$

$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

$$\left| \vec{a} \times \vec{b} \right| = \left| \vec{a} \right| \cdot \left| \vec{b} \right| \cdot \sin \left(\vec{a}, \vec{b} \right)$$

$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

 $\vec{b} = (b_x, b_y, b_z) = b_x \vec{i} + b_y \vec{j} + b_z \vec{k}$

$$\left| ec{a} imes ec{b}
ight| = \left| ec{a}
ight| \cdot \left| ec{b}
ight| \cdot \sin \left(ec{a}, ec{b}
ight)$$

$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

 $\vec{b} = (b_x, b_y, b_z) = b_x \vec{i} + b_y \vec{j} + b_z \vec{k}$

$$\left[\vec{a} imes \vec{b} = egin{vmatrix} \vec{i} & \vec{j} & \vec{k} \ a_x & a_y & a_z \ b_x & b_y & b_z \ \end{bmatrix}
ight]$$

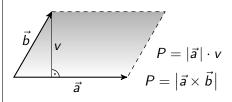
$$\left| \vec{a} imes \vec{b} \right| = \left| \vec{a} \right| \cdot \left| \vec{b} \right| \cdot \sin \left(\vec{a}, \vec{b} \right)$$

$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

 $\vec{b} = (b_x, b_y, b_z) = b_x \vec{i} + b_y \vec{j} + b_z \vec{k}$

$$ec{a} imes ec{b} = egin{bmatrix} ec{i} & ec{j} & ec{k} \ a_x & a_y & a_z \ b_x & b_y & b_z \ \end{bmatrix}$$

Površina paralelograma



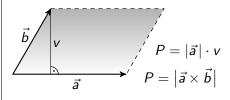
$$|\vec{a} imes \vec{b}| = |\vec{a}| \cdot |\vec{b}| \cdot \sin(\vec{a}, \vec{b})$$

$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

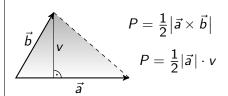
 $\vec{b} = (b_x, b_y, b_z) = b_x \vec{i} + b_y \vec{j} + b_z \vec{k}$

$$ec{a} imes ec{b} = egin{bmatrix} ec{i} & ec{j} & ec{k} \ a_x & a_y & a_z \ b_x & b_y & b_z \ \end{bmatrix}$$

Površina paralelograma



Površina trokuta



$$\left(ec{a}, ec{b}, ec{c}
ight) = \left(ec{a} imes ec{b}
ight) \cdot ec{c}$$

$$\left(\left(ec{a},ec{b},ec{c}
ight) = \left(ec{a} imesec{b}
ight) \cdot ec{c}
ight)$$

$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

$$\left(ec{a},ec{b},ec{c}
ight) = \left(ec{a} imes ec{b}
ight) \cdot ec{c}$$

$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

 $\vec{b} = (b_x, b_y, b_z) = b_x \vec{i} + b_y \vec{j} + b_z \vec{k}$

$$\left(ec{a},ec{b},ec{c}
ight) = \left(ec{a} imes ec{b}
ight) \cdot ec{c}$$

$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

$$\vec{b} = (b_x, b_y, b_z) = b_x \vec{i} + b_y \vec{j} + b_z \vec{k}$$

$$\vec{c} = (c_x, c_y, c_z) = c_x \vec{i} + c_y \vec{j} + c_z \vec{k}$$

$$\left(ec{a},ec{b},ec{c}
ight)=\left(ec{a} imesec{b}
ight)\cdotec{c}$$

$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

$$\vec{b} = (b_x, b_y, b_z) = b_x \vec{i} + b_y \vec{j} + b_z \vec{k}$$

$$\vec{c} = (c_x, c_y, c_z) = c_x \vec{i} + c_y \vec{j} + c_z \vec{k}$$

$$\left(ec{a}, ec{b}, ec{c}
ight) = egin{bmatrix} a_x & a_y & a_z \ b_x & b_y & b_z \ c_x & c_y & c_z \ \end{bmatrix}$$

$$\left(ec{a},ec{b},ec{c}
ight) = \left(ec{a} imes ec{b}
ight) \cdot ec{c}$$

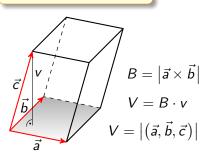
$$\vec{a} = (a_x, a_y, a_z) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$

$$\vec{b} = (b_x, b_y, b_z) = b_x \vec{i} + b_y \vec{j} + b_z \vec{k}$$

$$\vec{c} = (c_x, c_y, c_z) = c_x \vec{i} + c_y \vec{j} + c_z \vec{k}$$

$$\left(\vec{a}, \vec{b}, \vec{c}\right) = \begin{vmatrix} a_x & a_y & a_z \\ b_x & b_y & b_z \\ c_x & c_y & c_z \end{vmatrix}$$

Volumen paralelepipeda

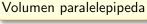


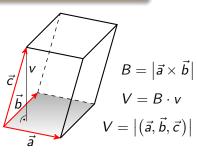
$$\left(ec{a},ec{b},ec{c}
ight) = \left(ec{a} imes ec{b}
ight) \cdot ec{c}$$

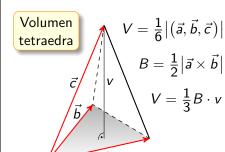
$$ec{a} = \left(a_x, a_y, a_z\right) = a_x \vec{i} + a_y \vec{j} + a_z \vec{k}$$
 $ec{b} = \left(b_x, b_y, b_z\right) = b_x \vec{i} + b_y \vec{j} + b_z \vec{k}$

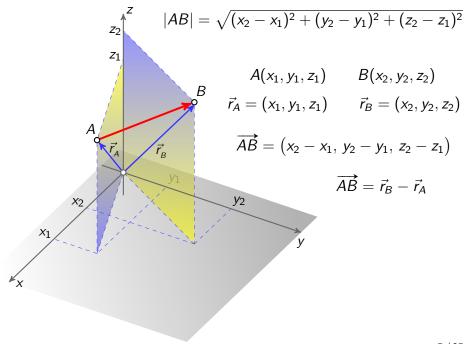
$$\vec{c} = (c_x, c_y, c_z) = c_x \vec{i} + c_y \vec{j} + c_z \vec{k}$$

$$\left(ec{a}, ec{b}, ec{c}
ight) = egin{bmatrix} a_x & a_y & a_z \ b_x & b_y & b_z \ c_x & c_y & c_z \ \end{pmatrix}$$







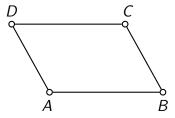


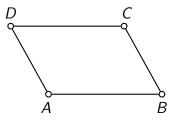
prvi zadatak

Zadatak 1

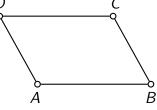
Zadane su točke A(2,3,-1), B(3,4,2) i C(1,0,-5).

- a) Odredite točku D tako da četverokut ABCD bude paralelogram.
- b) Odredite unutarnji kut paralelograma ABCD pri vrhu A.
- c) Izračunajte površinu paralelograma ABCD i duljinu visine paralelograma na stranicu AB.
- d) Ispitajte je li vektor $\vec{v} = (1, 2, -1)$ paralelan s ravninom paralelograma ABCD.
- e) Odredite ortogonalnu projekciju vektora v na ravninu paralelograma ABCD.

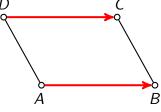




 $A(2,3,-1),\ B(3,4,2),\ C(1,0,-5)$

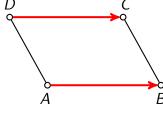


a)



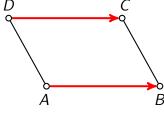
a)

7/25

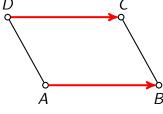


a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

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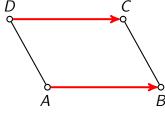


a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$
 $\overrightarrow{r_B} - \overrightarrow{r_A}$



a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$
 $\overrightarrow{r_B} - \overrightarrow{r_A} =$

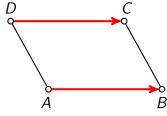
7 / 25



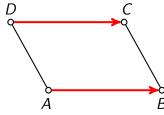
a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

 $\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$

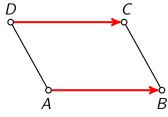
7 / 25



a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$
 $\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$
 $\vec{r}_D =$



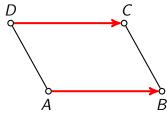
a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$
 $\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$
 $\vec{r}_D = \vec{r}_A$



a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B$$

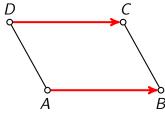


a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

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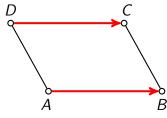
a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \overrightarrow{r_B} + \overrightarrow{r_C}$$

$$\overrightarrow{r_D} =$$

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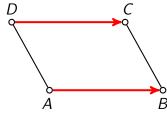
a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

$$\vec{r}_D = (2, 3, -1)$$

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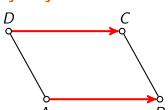


a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$

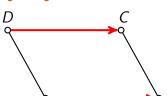
$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

$$\vec{r}_D = (2, 3, -1) - (3, 4, 2)$$



a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$
 $\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$
 $\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$
 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$

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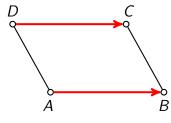
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

 $\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$
 $\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$
 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$
 $\vec{r}_D =$

a)

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

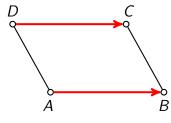


$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$
 $\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$
 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$
 $\vec{r}_D = (0, -5)$

 $\overrightarrow{AB} = \overrightarrow{DC}$

a)

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$



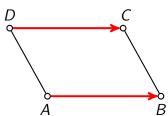
$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$
 $\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$
 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$
 $\vec{r}_D = (0, -1, -1)$

 $\overrightarrow{AB} = \overrightarrow{DC}$

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

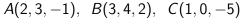
a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

 $\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$
 $\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$
 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$
 $\vec{r}_D = (0, -1, -8)$



a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

 $\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$
 $\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$
 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$
 $\vec{r}_D = (0, -1, -8)$
 $D(0, -1, -8)$



a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$
 $\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$
 $\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$
 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$
 $\vec{r}_D = (0, -1, -8)$
 $D(0, -1, -8)$

Rješenje

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$
 $A(2,3,-1), B(3,4,2), C(1,0,-5)$
 $A(2,3,-1), B(3,4,2), C(1,0,-5)$
 $A(2,3,-1), B(3,4,2), C(1,0,-5)$

 $\vec{r}_D = (0, -1, -8)$

D(0,-1,-8)

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\vec{A} = \vec{D} \vec{C}$$

$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

$$\vec{r}_D = (2,3,-1) - (3,4,2) + (1,0,-5)$$

$$\vec{r}_D = (0,-1,-8)$$

$$D(0,-1,-8)$$

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

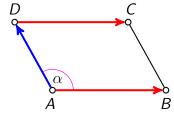
a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

 $\vec{r_B} - \vec{r_A} = \vec{r_C} - \vec{r_D}$
 $\vec{r_D} = \vec{r_A} - \vec{r_B} + \vec{r_C}$
 $\vec{r_D} = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$
 $\vec{r_D} = (0, -1, -8)$

b)
$$\alpha = \triangleleft (\overrightarrow{AB}, \overrightarrow{AD})$$

a)

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$



$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

$$\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$$

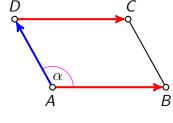
$$\vec{r}_D = (0, -1, -8)$$

$$D(0,-1,-8)$$

b)
$$\alpha = \sphericalangle (\overrightarrow{AB}, \overrightarrow{AD})$$

$$\cos \alpha =$$

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$



b)
$$\alpha = \sphericalangle (\overrightarrow{AB}, \overrightarrow{AD})$$

a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

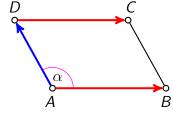
 $\cos \alpha =$

$$\vec{r}_D = (0, -1, -8)$$

 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$

$$D(0,-1,-8)$$

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$



a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$

 $\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$

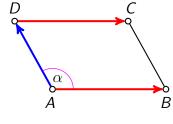
$$\vec{r}_D = (0, -1, -8)$$

$$D(0,-1,-8)$$

b)
$$\alpha = \sphericalangle (\overrightarrow{AB}, \overrightarrow{AD})$$

$$\cos \alpha = \frac{\overrightarrow{AB} \cdot \overrightarrow{AD}}{}$$

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$



a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$
 $\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$
 $\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$

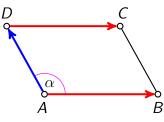
$$\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$$

$$\vec{r}_D = (0, -1, -8)$$

$$D(0,-1,-8)$$

b)
$$\alpha = \sphericalangle (\overrightarrow{AB}, \overrightarrow{AD})$$

$$\cos \alpha = \frac{\overrightarrow{AB} \cdot \overrightarrow{AD}}{\left| \overrightarrow{AB} \right| \cdot \left| \overrightarrow{AD} \right|}$$



a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$
 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$

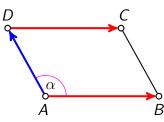
$$\vec{r}_D = (0, -1, -8)$$

$$D(0,-1,-8)$$

$$\overrightarrow{AB} =$$

b)
$$\alpha = \sphericalangle (\overrightarrow{AB}, \overrightarrow{AD})$$

$$\cos \alpha = \frac{\overrightarrow{AB} \cdot \overrightarrow{AD}}{\left| \overrightarrow{AB} \right| \cdot \left| \overrightarrow{AD} \right|}$$



$$\overrightarrow{AB} = \overrightarrow{DC}$$

a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$
 $\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$
 $\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$

$$\vec{r}_D = (0, -1, -8)$$

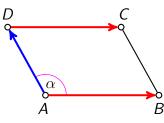
$$D(0,-1,-8)$$

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,$$

b)
$$\alpha = \sphericalangle (\overrightarrow{AB}, \overrightarrow{AD})$$

$$\cos \alpha = \frac{\overrightarrow{AB} \cdot \overrightarrow{AD}}{\left| \overrightarrow{AB} \right| \cdot \left| \overrightarrow{AD} \right|}$$



a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$

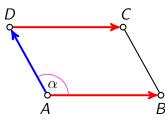
$$\vec{r}_D = (0, -1, -8)$$

$$D(0, -1, -8)$$

$$\overrightarrow{AB} = (1, 1,$$

b)
$$\alpha = \sphericalangle (\overrightarrow{AB}, \overrightarrow{AD})$$

$$\cos \alpha = \frac{\overrightarrow{AB} \cdot \overrightarrow{AD}}{\left| \overrightarrow{AB} \right| \cdot \left| \overrightarrow{AD} \right|}$$



$$\overrightarrow{\Delta R} = \overrightarrow{DO}$$

a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$
 $\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

$$\vec{r}_D = (2,3,-1) - (3,4,2) + (1,0,-5)$$

 $\vec{r}_D = (0,-1,-8)$

$$D(0,-1,-8)$$

$$1, -8)$$

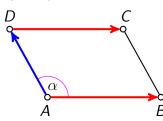
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1, 1, 3)$$

$$\mathsf{b)} \qquad \alpha = \sphericalangle \big(\overrightarrow{AB}, \overrightarrow{AD}\big)$$

$$\cos \alpha = \frac{\overrightarrow{AB} \cdot \overrightarrow{AD}}{\left| \overrightarrow{AB} \right| \cdot \left| \overrightarrow{AD} \right|}$$

Rješenje



a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$
 $\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$
 $\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$
 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$
 $\vec{r}_D = (0, -1, -8)$

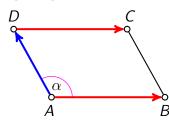
D(0,-1,-8)

$$\overrightarrow{AB} = (1, 1, 3)$$
 $\overrightarrow{AD} =$

b)
$$\alpha = \sphericalangle (\overrightarrow{AB}, \overrightarrow{AD})$$

$$\cos \alpha = \frac{\overrightarrow{AB} \cdot \overrightarrow{AD}}{|\overrightarrow{AB}| \cdot |\overrightarrow{AD}|}$$

Rješenje



a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$

$$\vec{r}_D = (0, -1, -8)$$

$$D(0,-1,-8)$$

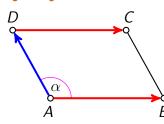
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3)$$
 $\overrightarrow{AD} = (-2,$

b)
$$\alpha = \sphericalangle (\overrightarrow{AB}, \overrightarrow{AD})$$

$$\cos \alpha = \frac{\overrightarrow{AB} \cdot \overrightarrow{AD}}{\left| \overrightarrow{AB} \right| \cdot \left| \overrightarrow{AD} \right|}$$

Rješenje



a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$AB = DC$$
$$\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$$

 $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$

$$\vec{r}_B + \vec{r}_C$$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

$$\vec{r}_D = (0, -1, -8)$$

$$D(0,-1,-8)$$

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1, 1, 3)$$
 $\overrightarrow{AD} = (-2, -4,$

b)
$$\alpha = \sphericalangle (\overrightarrow{AB}, \overrightarrow{AD})$$

$$\cos \alpha = \frac{\overrightarrow{AB} \cdot \overrightarrow{AD}}{\left| \overrightarrow{AB} \right| \cdot \left| \overrightarrow{AD} \right|}$$

$$\overrightarrow{AB} = (1,1,3)$$
 $\overrightarrow{AD} = (-2,-4,-7)$

a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

 $\vec{r}_B - \vec{r}_A = \vec{r}_C - \vec{r}_D$

$$=\overline{DC}$$

$$= \vec{r}_C - \vec{r}_D$$

$$\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$$

$$\vec{r}_B + \vec{r}_C$$

$$\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$$

 $\vec{r}_D = (0, -1, -8)$

$$-1, -8$$

$$D(0,-1,-8)$$

b)
$$\alpha = \langle (\overrightarrow{AB}, \overrightarrow{AD}) \rangle$$

$$\cos \alpha = \frac{\overrightarrow{AB} \cdot \overrightarrow{AD}}{\left| \overrightarrow{AB} \right| \cdot \left| \overrightarrow{AD} \right|}$$

Rješenje
$$\begin{array}{c}
D \\
A
\end{array}$$

$$\overrightarrow{A}\overrightarrow{B} - \overrightarrow{DC}$$

b)
$$\alpha = \sphericalangle(\overrightarrow{AB}, \overrightarrow{AD})$$

$$\cos \alpha = \frac{\overrightarrow{AB} \cdot \overrightarrow{AD}}{|\overrightarrow{AB}| \cdot |\overrightarrow{AD}|}$$

 $\overrightarrow{AB} = (1, 1, 3)$ $\overrightarrow{AD} = (-2, -4, -7)$

 $\overrightarrow{AR} = \overrightarrow{DC}$ $\vec{r}_B - \vec{r}_\Delta = \vec{r}_C - \vec{r}_D$ $\vec{r}_D = \vec{r}_A - \vec{r}_B + \vec{r}_C$ $\vec{r}_D = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$ $\vec{r}_D = (0, -1, -8)$

D(0,-1,-8)

 $\overrightarrow{AB} \cdot \overrightarrow{AD} =$

7/25

Rješenje
$$\overrightarrow{A}$$

$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_C}$$

b) $\alpha = \sphericalangle(\overrightarrow{AB}, \overrightarrow{AD})$ $\cos\alpha = \frac{\overrightarrow{AB} \cdot \overrightarrow{AD}}{|\overrightarrow{AB}| \cdot |\overrightarrow{AD}|}$

A(2,3,-1), B(3,4,2), C(1,0,-5)

 $\overrightarrow{AB} = (1, 1, 3)$ $\overrightarrow{AD} = (-2, -4, -7)$

a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$
 $\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$
 $\overrightarrow{r_D} = \overrightarrow{r_A} - \overrightarrow{r_B} + \overrightarrow{r_C}$
 $\overrightarrow{r_D} = (2, 3, -1) - (3, 4, 2) + (1, 0, -5)$
 $\overrightarrow{r_D} = (0, -1, -8)$
 $D(0, -1, -8)$

 $\overrightarrow{AB} \cdot \overrightarrow{AD} = 1 \cdot (-2)$

Rješenje

$$A(2, \vec{AB} = \vec{DC})$$
 $\vec{A} = \vec{DC}$
 $\vec{A} = \vec{C} = \vec{C}$
 $\vec{C} = \vec{C} = \vec$

 $\overrightarrow{AB} \cdot \overrightarrow{AD} = 1 \cdot (-2) + 1 \cdot (-4)$

 $\overrightarrow{AB} = (1, 1, 3)$ $\overrightarrow{AD} = (-2, -4, -7)$

b)
$$\alpha = \sphericalangle (\overrightarrow{AB}, \overrightarrow{AD})$$

$$\cos \alpha = \frac{\overrightarrow{AB} \cdot \overrightarrow{AD}}{\left| \overrightarrow{AB} \right| \cdot \left| \overrightarrow{AD} \right|}$$

$$ec{r}_B + ec{r}_C \ 4,2) + (1,0,-5)$$

Rješenje

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$
 $\overrightarrow{AB} = (1,1,3)$
 $\overrightarrow{AD} = (-2,-4,-7)$

a)

 $\overrightarrow{AB} = \overrightarrow{DC}$
 $\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$
 $\overrightarrow{r_D} = \overrightarrow{r_A} - \overrightarrow{r_B} + \overrightarrow{r_C}$
 $\overrightarrow{r_D} = (0,-1,-8)$
 $\overrightarrow{AB} \cdot \overrightarrow{AD} = 1 \cdot (-2) + 1 \cdot (-4) + 3 \cdot (-7)$
 $A(2,3,-1), B(3,4,2), C(1,0,-5)$
 $\overrightarrow{AD} = (-2,-4,-7)$

b)

 $\alpha = (-2,-4,-7)$
 $\alpha = (-2,-4,-7)$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$
a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$$

$$\overrightarrow{r_D} = (2,3,-1) - (3,4,2) + (1,0,-5)$$

$$\overrightarrow{r_D} = (0,-1,-8)$$

$$D(0,-1,-8)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AD} = 1 \cdot (-2) + 1 \cdot (-4) + 3 \cdot (-7) = -27$$

7/25

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| =$$

$$|\overrightarrow{AD}| =$$

$$|\overrightarrow{AD}| = (-2,-4,-7)$$

$$|\overrightarrow{AD}|$$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| = \sqrt{$$
a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \overrightarrow{r_B} + \overrightarrow{r_C}$$

$$\overrightarrow{r_D} = (2,3,-1) - (3,4,2) + (1,0,-5)$$

$$\overrightarrow{r_D} = (0,-1,-8)$$

$$D(0,-1,-8)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AD} = 1 \cdot (-2) + 1 \cdot (-4) + 3 \cdot (-7) = -27$$

$$7/25$$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| = \sqrt{(-2)^2}$$
a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \overrightarrow{r_B} + \overrightarrow{r_C}$$

$$\overrightarrow{r_D} = (2,3,-1) - (3,4,2) + (1,0,-5)$$

$$\overrightarrow{r_D} = (0,-1,-8)$$

$$D(0,-1,-8)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AD} = 1 \cdot (-2) + 1 \cdot (-4) + 3 \cdot (-7) = -27$$

$$7/25$$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| = \sqrt{(-2)^2 + (-4)^2}$$
a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \overrightarrow{r_B} + \overrightarrow{r_C}$$

$$\overrightarrow{r_D} = (2,3,-1) - (3,4,2) + (1,0,-5)$$

$$\overrightarrow{r_D} = (0,-1,-8)$$

$$D(0,-1,-8)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AD} = 1 \cdot (-2) + 1 \cdot (-4) + 3 \cdot (-7) = -27$$

$$7/25$$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| = \sqrt{(-2)^2 + (-4)^2 + (-7)^2}$$
a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \overrightarrow{r_B} + \overrightarrow{r_C}$$

$$\overrightarrow{r_D} = (2,3,-1) - (3,4,2) + (1,0,-5)$$

$$\overrightarrow{r_D} = (0,-1,-8)$$

$$D(0,-1,-8)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AD} = 1 \cdot (-2) + 1 \cdot (-4) + 3 \cdot (-7) = -27$$

$$7/25$$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| = \sqrt{(-2)^2 + (-4)^2 + (-7)^2} = \sqrt{69}$$
a)
$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \overrightarrow{r_B} + \overrightarrow{r_C}$$

$$\overrightarrow{r_D} = (2,3,-1) - (3,4,2) + (1,0,-5)$$

$$\overrightarrow{r_D} = (0,-1,-8)$$

$$D(0,-1,-8)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AD} = 1 \cdot (-2) + 1 \cdot (-4) + 3 \cdot (-7) = -27$$

$$7/25$$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| = \sqrt{(-2)^2 + (-4)^2 + (-7)^2} = \sqrt{69}$$

$$|\overrightarrow{AB}| = |\overrightarrow{AB}| = |\overrightarrow{AB$$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| = \sqrt{(-2)^2 + (-4)^2 + (-7)^2} = \sqrt{69}$$

$$|\overrightarrow{AB}| = \overrightarrow{DC}$$

$$|\overrightarrow{AB}| = \overrightarrow{T}_C - \overrightarrow{T}_D$$

$$|\overrightarrow{T}_D = \overrightarrow{T}_A - \overrightarrow{T}_B + \overrightarrow{T}_C$$

$$|\overrightarrow{T}_D = (2,3,-1) - (3,4,2) + (1,0,-5)$$

$$|\overrightarrow{T}_D = (0,-1,-8)$$

$$|\overrightarrow{D}(0,-1,-8)|$$

$$\overrightarrow{AB} \cdot \overrightarrow{AD} = 1 \cdot (-2) + 1 \cdot (-4) + 3 \cdot (-7) = -27$$

$$7/25$$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| = \sqrt{(-2)^2 + (-4)^2 + (-7)^2} = \sqrt{69}$$

$$|\overrightarrow{AB}| = \overrightarrow{DC}$$

$$|\overrightarrow{AB}| = \overrightarrow{T} = \overrightarrow{T}$$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| = \sqrt{(-2)^2 + (-4)^2 + (-7)^2} = \sqrt{69}$$

$$|\overrightarrow{AB}| = |\overrightarrow{DC}|$$

$$|\overrightarrow{AB}| = |\overrightarrow{DC}|$$

$$|\overrightarrow{AB}| = |\overrightarrow{C}|$$

$$|\overrightarrow{C}| =$$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| = \sqrt{(-2)^2 + (-4)^2 + (-7)^2} = \sqrt{69}$$

$$|\overrightarrow{AB}| = |\overrightarrow{DC}| = \sqrt{1^2 + 1^2 + 3^2}$$
b)
$$\alpha = \langle (\overrightarrow{AB}, \overrightarrow{AD}) \rangle$$

$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \overrightarrow{r_B} + \overrightarrow{r_C}$$

$$\overrightarrow{r_D} = (2,3,-1) - (3,4,2) + (1,0,-5)$$

$$\overrightarrow{r_D} = (0,-1,-8)$$

$$D(0,-1,-8)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AD} = 1 \cdot (-2) + 1 \cdot (-4) + 3 \cdot (-7) = -27$$

$$7/25$$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| = \sqrt{(-2)^2 + (-4)^2 + (-7)^2} = \sqrt{69}$$

$$|\overrightarrow{AB}| = |\overrightarrow{DC}| = \sqrt{1^2 + 1^2 + 3^2} = \sqrt{11}$$
b)
$$\alpha = \sphericalangle(\overrightarrow{AB}, \overrightarrow{AD})$$

$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \overrightarrow{r_B} + \overrightarrow{r_C}$$

$$\overrightarrow{r_D} = (2,3,-1) - (3,4,2) + (1,0,-5)$$

$$\overrightarrow{r_D} = (0,-1,-8)$$

$$D(0,-1,-8)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AD} = 1 \cdot (-2) + 1 \cdot (-4) + 3 \cdot (-7) = -27$$

$$7/25$$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| = \sqrt{(-2)^2 + (-4)^2 + (-7)^2} = \sqrt{69}$$

$$|\overrightarrow{AB}| = |\overrightarrow{DC}| = \sqrt{1^2 + 1^2 + 3^2} = \sqrt{11}$$
b)
$$\alpha = \sphericalangle(\overrightarrow{AB}, \overrightarrow{AD})$$

$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \overrightarrow{r_B} + \overrightarrow{r_C}$$

$$\overrightarrow{r_D} = (2,3,-1) - (3,4,2) + (1,0,-5)$$

$$\overrightarrow{r_D} = (0,-1,-8)$$

$$D(0,-1,-8)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AD} = 1 \cdot (-2) + 1 \cdot (-4) + 3 \cdot (-7) = -27$$

$$7/25$$

Rješenje
$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AD}| = \sqrt{(-2)^2 + (-4)^2 + (-7)^2} = \sqrt{69}$$

$$|\overrightarrow{AB}| = |\overrightarrow{DC}| = \sqrt{1^2 + 1^2 + 3^2} = \sqrt{11}$$
b)
$$\alpha = \sphericalangle(\overrightarrow{AB}, \overrightarrow{AD})$$

$$\overrightarrow{AB} = \overrightarrow{DC}$$

$$\overrightarrow{r_B} - \overrightarrow{r_A} = \overrightarrow{r_C} - \overrightarrow{r_D}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \overrightarrow{r_B} + \overrightarrow{r_C}$$

$$\overrightarrow{r_D} = (2,3,-1) - (3,4,2) + (1,0,-5)$$

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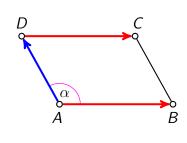
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$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \overrightarrow{AD} = (-2,-4,-7)$$

$$P = |\overrightarrow{AB} \times \overrightarrow{AD}|$$

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$$\overrightarrow{AB} \times \overrightarrow{AD} =$$

$$C$$
 A
 B

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$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \end{vmatrix}$$

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$$C$$
 A
 B

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 $P = |\overrightarrow{AB} imes \overrightarrow{AD}|$

A(2,3,-1), B(3,4,2), C(1,0,-5)

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$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{j} & \overrightarrow{k} \\ 1 & 3 \\ 2 & -4 & -7 \end{vmatrix} = \overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix}$$

 $\overrightarrow{AB} imes \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} & \overrightarrow{j} & \overrightarrow{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$

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+ \vec{j} · $A_{ij} = (-1)^{i+j} M_{ij}$ 8 / 25

 $P = |\overrightarrow{AB} \times \overrightarrow{AD}|$

 $\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} & \overrightarrow{j} & k \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$

 $P = |\overrightarrow{AB} \times \overrightarrow{AD}|$

A(2,3,-1), B(3,4,2), C(1,0,-5)

 $\overrightarrow{AB} = (1, 1, 3)$ $\overrightarrow{AD} = (-2, -4, -7)$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} i \\ 1 \\ 2 \end{vmatrix}$$

 $+\vec{i}\cdot(-1)^{1+2}$

c)
$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} & \overrightarrow{j} \\ 1 & 1 \\ -2 & -4 \end{vmatrix}$$

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

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$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} & \overrightarrow{AB} \\ 1 & 3 \\ -2 & 4 & -7 \end{vmatrix} = \overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} + \overrightarrow{j} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ -2 & -7 \end{vmatrix}$$

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c)

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} \\ 1 \\ -2 \end{vmatrix}$$

$$+\vec{j}\cdot(-1)^{1+2}\begin{vmatrix} 1 & 3 \\ -2 & -7 \end{vmatrix} + \vec{k}\cdot$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} & \overrightarrow{j} & \overrightarrow{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$$

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$$\begin{vmatrix} 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix}$$

$$+ \ ec{j} \cdot (-1)^{1+2} \left| egin{matrix} 1 & 3 \ -2 & -7 \end{matrix}
ight| + \ ec{k} \cdot (-1)^{1+3}$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} & \overrightarrow{j} \\ 1 & 1 \\ -2 & -4 & -7 \end{vmatrix} = \overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$$

 $\begin{vmatrix} -2 & -4 & -7 \end{vmatrix} + \vec{j} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ -1 & -7 \end{vmatrix} + \vec{k} \cdot (-1)^{1+3} \begin{vmatrix} 1 & 1 \\ -1 & -7 \end{vmatrix}$

$$+ \vec{j} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ -2 & -7 \end{vmatrix} + \vec{k} \cdot (-1)^{1+3} \begin{vmatrix} 1 & 1 \\ -2 & -4 \end{vmatrix}$$

$$A_{ij} = (-1)^{i+j} M_{ij}$$

/ 25

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \vec{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} 1 \\ 1 \\ -2 \end{vmatrix}$$

$$\begin{vmatrix} \vec{k} \\ 3 \\ -7 \end{vmatrix} = \vec{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 \\ -1 \end{vmatrix}$$

$$\begin{vmatrix} -2 & -4 & -7 \end{vmatrix}$$
 $+ \vec{j} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ -2 & -7 \end{vmatrix} + \vec{k} \cdot (-1)^{1+3} \begin{vmatrix} 1 & 1 \\ -2 & -4 \end{vmatrix} =$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \vec{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$$

 $\begin{vmatrix} 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \begin{vmatrix} -4 & -7 \\ & & & \end{vmatrix} + \vec{i} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ & & & \end{vmatrix} + \vec{k} \cdot (-1)^{1+3} \begin{vmatrix} 1 & 1 \\ & & & \end{vmatrix} =$

$$+ \vec{j} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ -2 & -7 \end{vmatrix} + \vec{k} \cdot (-1)^{1+3} \begin{vmatrix} 1 & 1 \\ -2 & -4 \end{vmatrix} =$$

$$= 5\vec{i} + \vec{j}$$

$$A_{ij} = (-1)^{i+j} M_{ij}$$

/ 25

$$\overrightarrow{A}(2,3,-1), \quad B(3,4,2), \quad C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \qquad \overrightarrow{AD} = (-2,-4,-7)$$

$$\overrightarrow{AB} = |\overrightarrow{AB} \times \overrightarrow{AD}|$$

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$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} & \overrightarrow{j} & \overrightarrow{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} i & j \\ 1 & 1 \\ -2 & -4 \end{vmatrix}$$

$$+ \overrightarrow{i} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \end{vmatrix}$$

$$+ \, ec{j} \cdot (-1)^{1+2} egin{bmatrix} 1 & 3 \ -2 & -7 \end{bmatrix} + \, ec{k} \cdot (-1)^{1+3} egin{bmatrix} 1 & 1 \ -2 & -4 \end{bmatrix} =$$

 $A_{ij} = (-1)^{i+j} M_{ij}$ $=5\vec{i}+\vec{i}-2\vec{k}$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \vec{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} 1 \\ 1 \\ -2 \end{vmatrix}$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} & \overrightarrow{j} \\ 1 & 1 \\ -2 & -4 \end{vmatrix}$$

$$\begin{vmatrix} \vec{i} & \vec{j} & k \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \vec{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 \\ -4 \end{vmatrix}$$

$$AB \times AD = \begin{vmatrix} 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \vec{i} \cdot (-1) \cdot \begin{vmatrix} -4 & -7 \\ -2 & -4 \end{vmatrix} = \vec{j} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ -2 & -7 \end{vmatrix} + \vec{k} \cdot (-1)^{1+3} \begin{vmatrix} 1 & 1 \\ -2 & -4 \end{vmatrix} = \vec{i} \cdot (-1)^{1+3} \cdot (-1)^{$$

$$\left| i \cdot (-1)^{1+1} \right|^{1}$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} & \overrightarrow{j} & \overrightarrow{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$$

 $+ \vec{j} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ -2 & -7 \end{vmatrix} + \vec{k} \cdot (-1)^{1+3} \begin{vmatrix} 1 & 1 \\ -2 & -4 \end{vmatrix} =$ $A_{ij} = (-1)^{i+j} M_{ij}$ $=5\vec{i}+\vec{i}-2\vec{k}=(5,1,-2)$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} & \overrightarrow{j} & \overrightarrow{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix}$$

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$$+ \vec{j} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ -2 & -7 \end{vmatrix} + \vec{k} \cdot (-1)^{1+3} \begin{vmatrix} 1 & 1 \\ -2 & -4 \end{vmatrix} =$$

$$= \vec{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -1 \end{vmatrix}$$

$$\begin{vmatrix} i \cdot (-1)^{1+1} \\ -4 \end{vmatrix}$$

$$=i\cdot (-1)^{1+1}\begin{vmatrix} -4 & -4 \end{vmatrix}$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} & \overrightarrow{j} & \overrightarrow{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} 7 & 3 & k \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix}$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \vec{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix}$$

$$+ \vec{j} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ -2 & -7 \end{vmatrix} + \vec{k} \cdot (-1)^{1+3} \begin{vmatrix} 1 & 1 \\ -2 & -4 \end{vmatrix} =$$

$$\begin{vmatrix} \vec{i} \cdot (-1)^{1+1} \end{vmatrix} = \vec{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 \\ -4 \end{vmatrix}$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \vec{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} 1 \\ 1 \\ -2 \end{vmatrix}$$

$$\overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} & \overrightarrow{j} & \overrightarrow{k} \\ 1 & 1 & 3 \\ -2 & -4 & -4 \end{vmatrix}$$

$$\overrightarrow{AB} imes \overrightarrow{AD} = egin{array}{ccc} ec{i} & ec{j} & ec{k} \ 1 & 1 & 3 \ -2 & -4 & -7 \ \end{array} = ec{i} \cdot (-1)^{1+1} egin{array}{ccc} 1 & 3 \ -4 & -7 \ \end{array} + ec{j} \cdot (-1)^{1+2} egin{array}{ccc} 1 & 3 \ -2 & -7 \ \end{array} + ec{k} \cdot (-1)^{1+3} egin{array}{ccc} 1 & 1 \ -2 & -4 \ \end{array} =$$

$$|\vec{k} \cdot (-1)|$$

$$\begin{vmatrix} 1 \\ -4 \end{vmatrix}$$

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = \sqrt{5^2 + 1^2 + (-2)^2}$$

$$P = |\overrightarrow{AB} \times \overrightarrow{AD}|$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 3 \end{vmatrix} = \vec{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \overrightarrow{i} & \overrightarrow{j} & \overrightarrow{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$$

 $\begin{vmatrix} -2 & -4 & -7 \end{vmatrix}$ $+ \vec{j} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ -2 & -7 \end{vmatrix} + \vec{k} \cdot (-1)^{1+3} \begin{vmatrix} 1 & 1 \\ -2 & -4 \end{vmatrix} =$

 $=5\vec{i}+\vec{i}-2\vec{k}=(5,1,-2)$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \vec{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} +$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} i & j \\ 1 & 1 \\ -2 & -1 \end{vmatrix}$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} i & j & k \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix}$$

$$+\vec{j}\cdot(-1)^{1+2}\begin{vmatrix}1&3\\-2&-7\end{vmatrix}+\vec{k}\cdot(-1)^{1+3}\begin{vmatrix}1&1\\-2&-4\end{vmatrix}=$$

$$\overrightarrow{A}(2,3,-1), \ B(3,4,2), \ C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = \sqrt{5^2 + 1^2 + (-2)^2} = \sqrt{30}$$

$$P = |\overrightarrow{AB} \times \overrightarrow{AD}|$$

$$P = \sqrt{30}$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \vec{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} + \vec{j} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ -2 & -7 \end{vmatrix} + \vec{k} \cdot (-1)^{1+3} \begin{vmatrix} 1 & 1 \\ -2 & -4 \end{vmatrix} =$$

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

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 $=5\vec{i}+\vec{j}-2\vec{k}=(5,1,-2)$ $A_{ij}=(-1)^{i+j}M_{ij}$ _{8/25}

$$\overrightarrow{AB} = (1, 1, 3) \quad \overrightarrow{AD} = (-2, -4, -7)$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = \sqrt{5^2 + 1^2 + (-2)^2} = \sqrt{30}$$

$$\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{AB} \times \overrightarrow{AD}|$$

$$P = |\overrightarrow{AB} \times \overrightarrow{AD}|$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}|$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}|$$

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$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}|$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \cdot (-1)^{1+1}| |\overrightarrow{A} \quad \overrightarrow{AD}|$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}|$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}|$$

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 $=5\vec{i}+\vec{j}-2\vec{k}=(5,1,-2)$ $A_{ij}=(-1)^{i+j}M_{ij}$ _{8/25}

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = \sqrt{5^2 + 1^2 + (-2)^2} = \sqrt{30}$$

$$P = |\overrightarrow{AB} \times \overrightarrow{AD}|$$

$$P = |\overrightarrow{A$$

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

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$$P = |\overrightarrow{A$$

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = \sqrt{5^2 + 1^2 + (-2)^2} = \sqrt{30}$$

$$P = |\overrightarrow{AB} \times \overrightarrow{AD}|$$

$$P = |\overrightarrow{AB}| \cdot v$$

$$P = |\overrightarrow{AB}| \cdot v$$

$$P = |\overrightarrow{AB}| \cdot v$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}|$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}|$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}|$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}|$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{AB}| \cdot v$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| =$$

$$A(2,3,-1), B(3,4,2), C(1,0,-5)$$

$$\overrightarrow{AB} = (1,1,3) \quad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = \sqrt{5^2 + 1^2 + (-2)^2} = \sqrt{30}$$

$$P = |\overrightarrow{AB} \times \overrightarrow{AD}|$$

$$P = |\overrightarrow{AB}| \cdot v$$

$$V = \frac{P}{|\overrightarrow{AB}|}$$

$$\overrightarrow{AB} \times \overrightarrow{AD} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix} = \vec{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} + \begin{vmatrix} \vec{j} \cdot (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ -2 & -7 \end{vmatrix} + \vec{k} \cdot (-1)^{1+3} \begin{vmatrix} 1 & 1 \\ -2 & -4 \end{vmatrix} = 1$$

$$= 5\vec{i} + \vec{j} - 2\vec{k} = (5, 1, -2)$$

$$A(2, 3, -1), B(3, 4, 2), C(1, 0, -5)$$

$$\overrightarrow{AD} = (-2, -4, -7)$$

$$\overrightarrow{AD$$

$$|\overrightarrow{AB}| = \sqrt{11} \qquad A(2,3,-1), \quad B(3,4,2), \quad C(1,0,-5)$$

$$|\overrightarrow{AB}| = (1,1,3) \qquad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = \sqrt{5^2 + 1^2 + (-2)^2} = \sqrt{30}$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{AB} \times \overrightarrow{AD}|$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{AB} \times \overrightarrow{AD}|$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{AB}| \cdot v$$

$$|\overrightarrow{AB}| = |\overrightarrow{AB}|$$

$$|\overrightarrow{AB}| = \sqrt{11} \qquad A(2,3,-1), \quad B(3,4,2), \quad C(1,0,-5)$$

$$|\overrightarrow{AB}| = (1,1,3) \qquad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = \sqrt{5^2 + 1^2 + (-2)^2} = \sqrt{30}$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{AB} \times \overrightarrow{AD}| \qquad P = |\overrightarrow{AB}| \cdot v$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}| = |\overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} + |\overrightarrow{v} = \frac{\sqrt{30}}{\sqrt{11}}$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}| = |\overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} + |\overrightarrow{v} = \frac{\sqrt{30}}{\sqrt{11}}$$

$$|\overrightarrow{Aj}| = (-1)^{1+2} \begin{vmatrix} 1 & 3 \\ -2 & -7 \end{vmatrix} + |\overrightarrow{k} \cdot (-1)^{1+3} \begin{vmatrix} 1 & 1 \\ -2 & -4 \end{vmatrix} = |\overrightarrow{Aj}| = (-1)^{1+1} |\overrightarrow{Aj}| |\overrightarrow{Aj}| = (-1)^{1$$

$$|\overrightarrow{AB}| = \sqrt{11} \qquad A(2,3,-1), \quad B(3,4,2), \quad C(1,0,-5)$$

$$|\overrightarrow{AB}| = (1,1,3) \qquad \overrightarrow{AD} = (-2,-4,-7)$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = \sqrt{5^2 + 1^2 + (-2)^2} = \sqrt{30}$$

$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{AB} \times \overrightarrow{AD}| \qquad P = |\overrightarrow{AB}| \cdot v$$

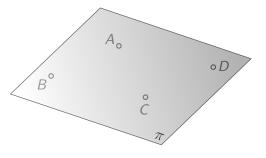
$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}| = |\overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} + |\overrightarrow{v} = \frac{\sqrt{30}}{\sqrt{11}}|$$

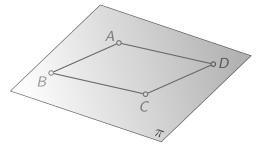
$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}| = |\overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} + |\overrightarrow{v} = \frac{\sqrt{30}}{\sqrt{11}}|$$

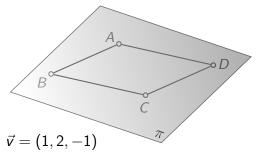
$$|\overrightarrow{AB} \times \overrightarrow{AD}| = |\overrightarrow{i} \quad \overrightarrow{j} \quad \overrightarrow{k}| = |\overrightarrow{i} \cdot (-1)^{1+1} \begin{vmatrix} 1 & 3 \\ -4 & -7 \end{vmatrix} + |\overrightarrow{v} = \frac{\sqrt{30}}{\sqrt{11}}|$$

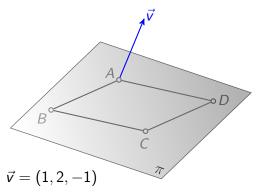
$$|\overrightarrow{A}| = |\overrightarrow{A}| = |\overrightarrow{A}$$

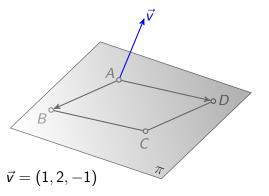


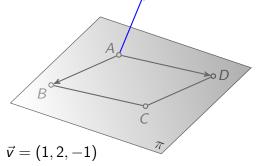












 $(\overrightarrow{AB}, \overrightarrow{AD}, \overrightarrow{v}) =$

 $\overrightarrow{AB} = (1, 1, 3)$ $\overrightarrow{AD} = (-2, -4, -7)$

$$\vec{v} = (1, 2, -1)$$

 $\left(\overrightarrow{AB},\overrightarrow{AD},\overrightarrow{v}\right) = \left| \right|$

 $\overrightarrow{AB} = (1, 1, 3)$ $\overrightarrow{AD} = (-2, -4, -7)$

 $\left(\overrightarrow{AB},\overrightarrow{AD},\overrightarrow{v}\right) = \begin{vmatrix} 1 & 1 & 3 \\ & & \end{vmatrix}$

d)

 $\vec{v} = (1, 2, -1)$

 $(\overrightarrow{AB}, \overrightarrow{AD}, \overrightarrow{v}) = \begin{vmatrix} 1 & 1 & 3 \\ -2 & -4 & -7 \end{vmatrix}$

d)

 $\vec{v} = (1, 2, -1)$

$$A \rightarrow D$$

 $(\overrightarrow{AB}, \overrightarrow{AD}, \overrightarrow{v}) = \begin{vmatrix} 1 & 1 & 3 \\ -2 & -4 & -7 \\ 1 & 2 & -1 \end{vmatrix}$

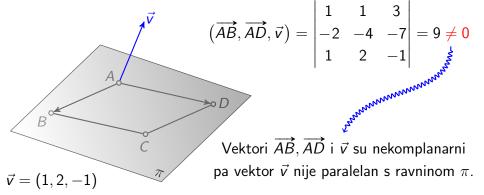
d)

 $\vec{v} = (1, 2, -1)$

$$(\overrightarrow{AB}, \overrightarrow{AD}, \overrightarrow{v}) = \begin{vmatrix} 1 & 1 & 3 \\ -2 & -4 & -7 \\ 1 & 2 & -1 \end{vmatrix} = 9$$

$$(\overrightarrow{AB}, \overrightarrow{AD}, \overrightarrow{v}) = \begin{vmatrix} 1 & 1 & 3 \\ -2 & -4 & -7 \\ 1 & 2 & -1 \end{vmatrix} = 9 \neq 0$$

d)
$$\overrightarrow{AB} = (1, 1, 3)$$
 $\overrightarrow{AD} = (-2, -4, -7)$

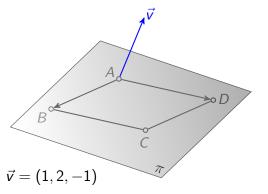


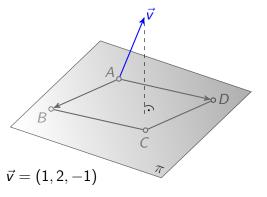
$$(\overrightarrow{AB}, \overrightarrow{AD}, \overrightarrow{v}) = \begin{vmatrix} 1 & 1 & 3 \\ -2 & -4 & -7 \\ 1 & 2 & -1 \end{vmatrix} = 9 \neq 0$$

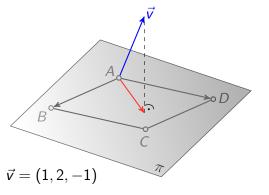
Vektori $\overrightarrow{AB}, \overrightarrow{AD}$ i \overrightarrow{v} su nekomplanarni pa vektor \overrightarrow{v} nije paralelan s ravninom π .

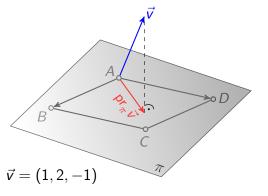
Kako je $(\overrightarrow{AB}, \overrightarrow{AD}, \overrightarrow{v}) > 0$, vektori $\overrightarrow{AB}, \overrightarrow{AD}$ i \overrightarrow{v}

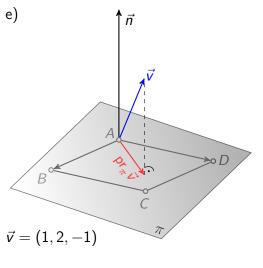
Kako je $(AB, AD, \vec{v}) > 0$, vektori AB, AD i \vec{v} u danom poretku čine jednu desnu bazu za V^3 .

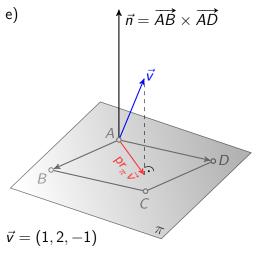


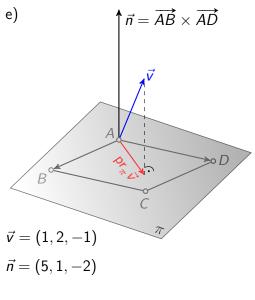


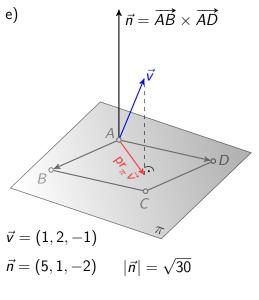


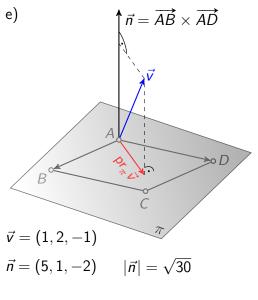


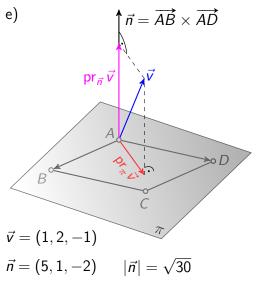


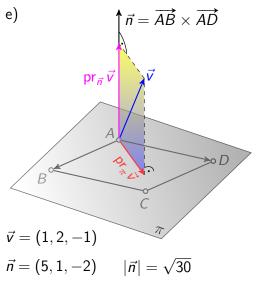


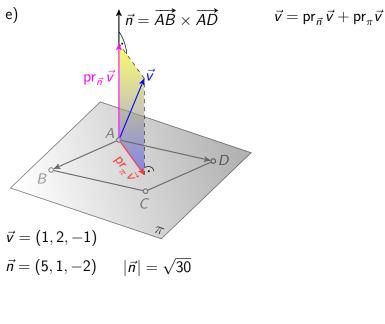


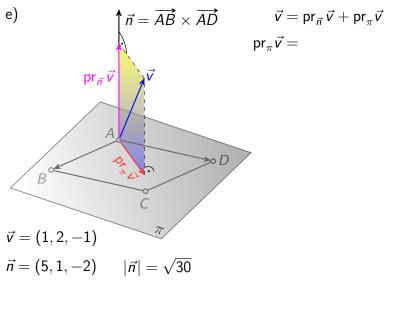


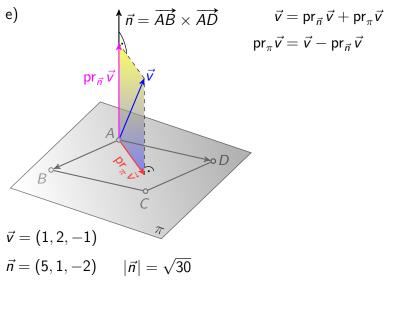


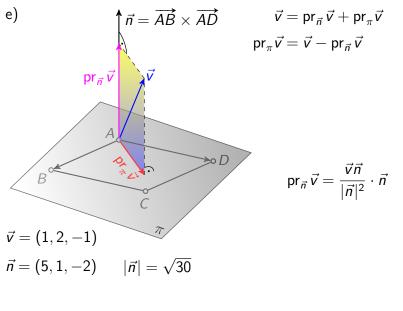


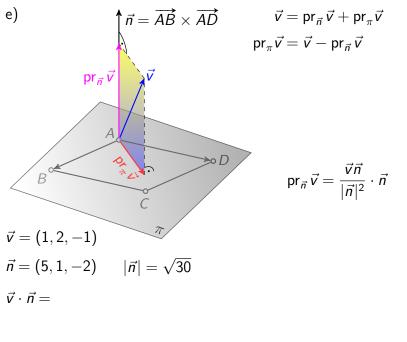


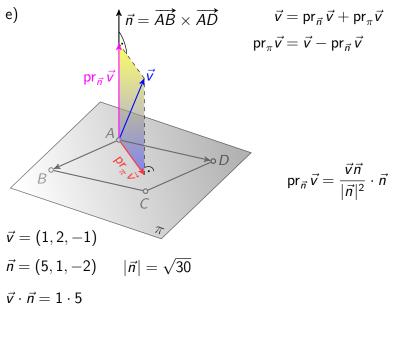


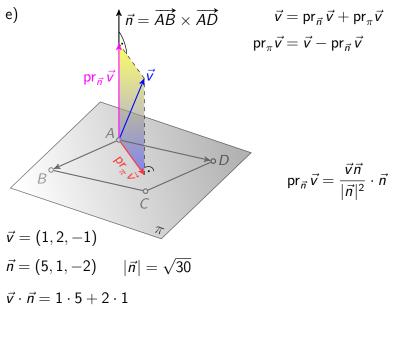


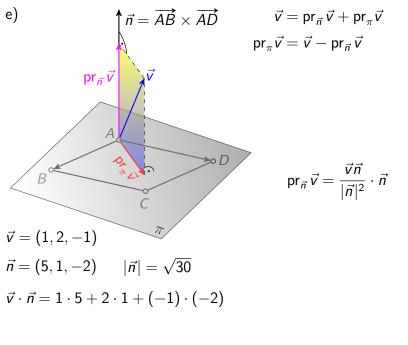


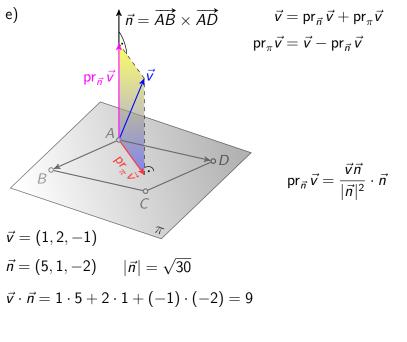


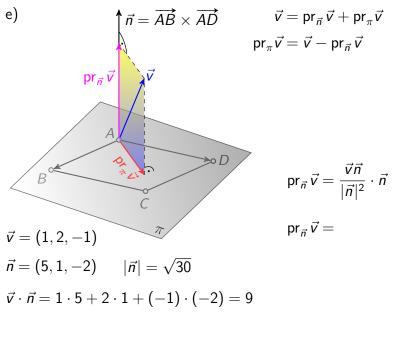


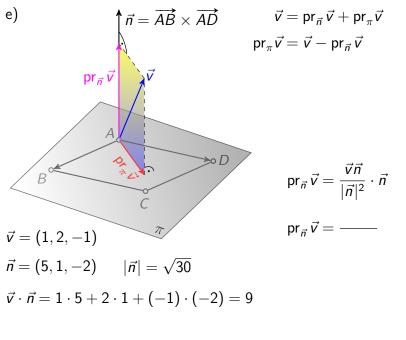


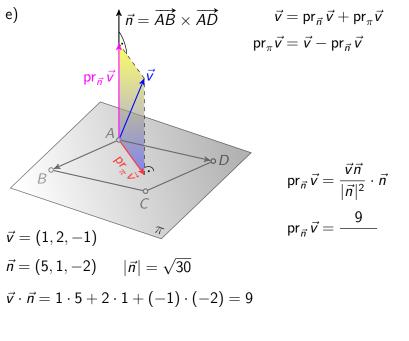


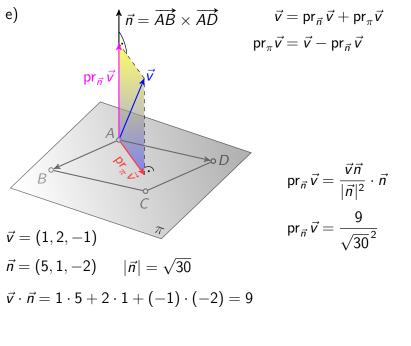


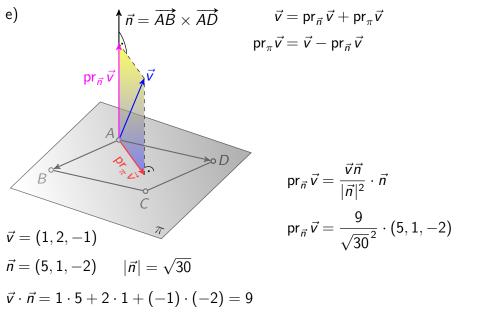


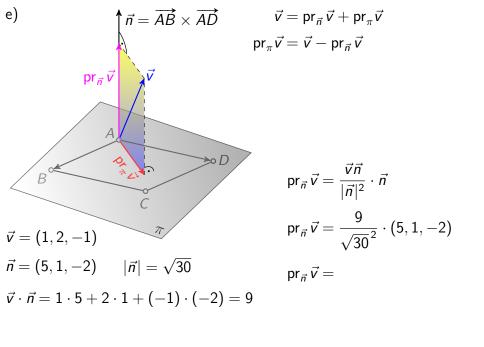


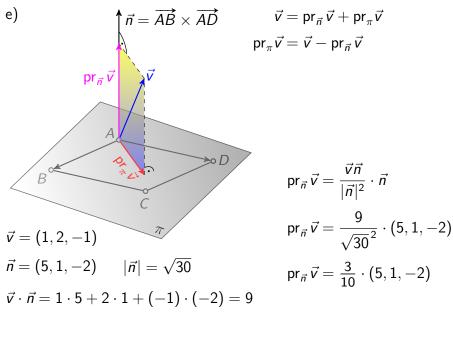


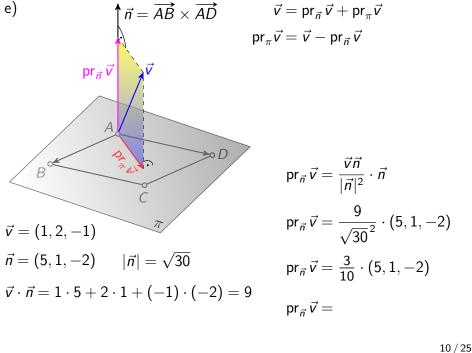


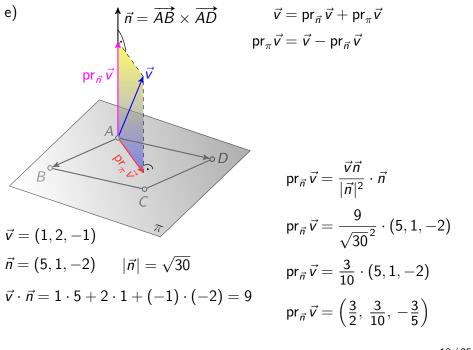


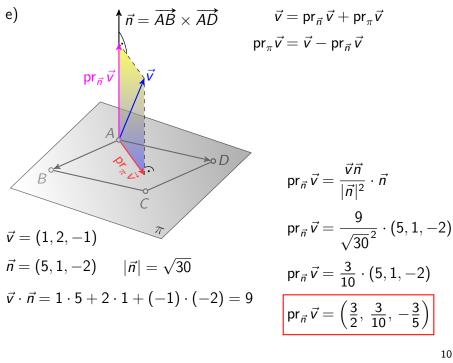


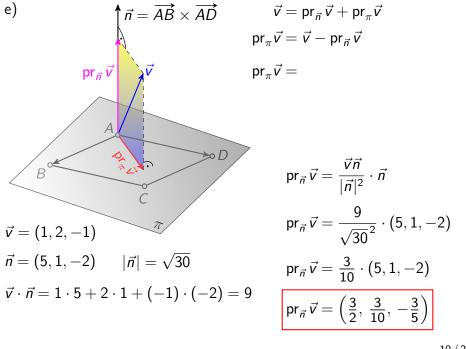


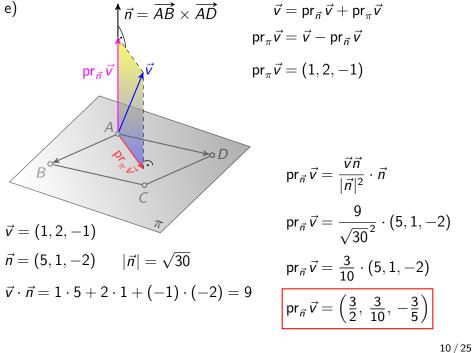


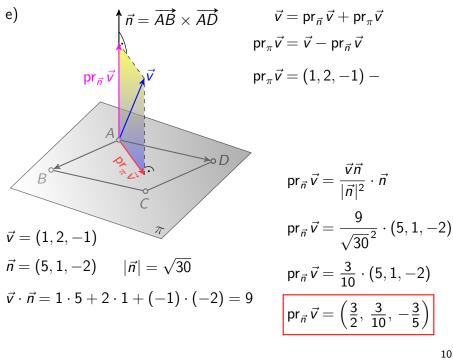


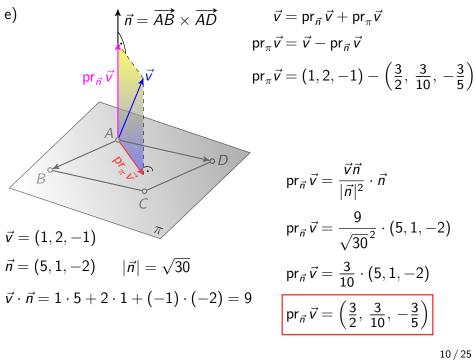










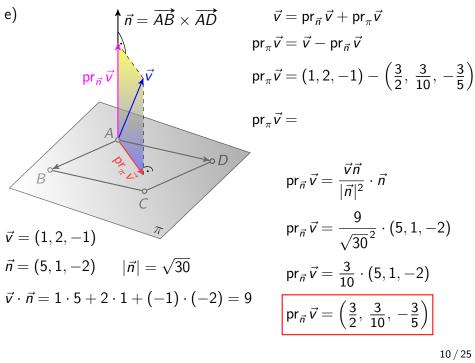


$$\operatorname{pr}_{ec{n}} ec{v} = rac{ec{v} ec{n}}{|ec{n}|^2} \cdot ec{n}$$

 $\operatorname{pr}_{\vec{n}} \vec{v} = \frac{9}{\sqrt{30}^2} \cdot (5, 1, -2)$

 $\operatorname{pr}_{\vec{n}} \vec{v} = \frac{3}{10} \cdot (5, 1, -2)$

 $\vec{v} = \operatorname{pr}_{\vec{n}} \vec{v} + \operatorname{pr}_{\vec{n}} \vec{v}$



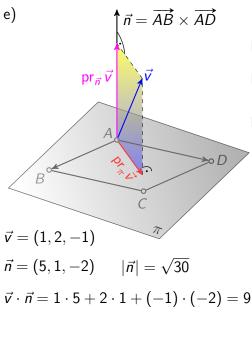
$$\begin{aligned} & \mathsf{pr}_{\vec{n}} \, \vec{v} = \frac{\vec{v} \vec{n}}{|\vec{n}|^2} \cdot \vec{n} \\ & \mathsf{pr}_{\vec{n}} \, \vec{v} = \frac{9}{\sqrt{30}^2} \cdot (5, 1, -2) \\ & \mathsf{pr}_{\vec{n}} \, \vec{v} = \frac{3}{10} \cdot (5, 1, -2) \end{aligned}$$

 $\operatorname{pr}_{\vec{n}} \vec{v} = \left(\frac{3}{2}, \frac{3}{10}, -\frac{3}{5}\right)$

 $\vec{v} = \operatorname{pr}_{\vec{n}} \vec{v} + \operatorname{pr}_{\vec{n}} \vec{v}$

 $\operatorname{pr}_{\pi} \vec{v} = \vec{v} - \operatorname{pr}_{\vec{n}} \vec{v}$

 $\operatorname{pr}_{\pi} \vec{v} =$

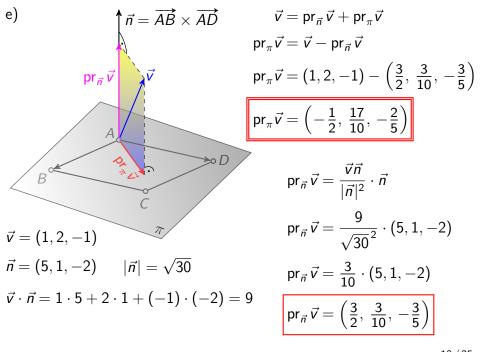


 $\operatorname{pr}_{\pi} \vec{\mathsf{v}} = \left(-\frac{1}{2}, \, \frac{17}{10}, \, -\frac{2}{5} \right)$ $\operatorname{pr}_{\vec{n}} \vec{v} = \frac{\vec{v}\vec{n}}{|\vec{n}|^2} \cdot \vec{n}$ $\operatorname{pr}_{\vec{n}} \vec{v} = \frac{9}{\sqrt{30}^2} \cdot (5, 1, -2)$ $\operatorname{pr}_{\vec{n}} \vec{v} = \frac{3}{10} \cdot (5, 1, -2)$ $\operatorname{pr}_{\vec{n}} \vec{v} = \left(\frac{3}{2}, \frac{3}{10}, -\frac{3}{5}\right)$

 $\operatorname{pr}_{\pi} \vec{v} = (1, 2, -1) - \left(\frac{3}{2}, \frac{3}{10}, -\frac{3}{5}\right)$

 $\vec{v} = \operatorname{pr}_{\vec{n}} \vec{v} + \operatorname{pr}_{\vec{n}} \vec{v}$

 $\operatorname{pr}_{\pi} \vec{v} = \vec{v} - \operatorname{pr}_{\vec{n}} \vec{v}$



Zadatak 2

Zadani su vektori $\vec{a} = (2m, 1, 1 - m)$, $\vec{b} = (-1, 3, 0)$ i $\vec{c} = (5, -1, 8)$.

- a) Odredite $m \in \mathbb{R}$ tako da vektor \vec{a} zatvara jednake kutove s vektorima \vec{b} i \vec{c} .
- b) Za pronađeni m iz a) dijela zadatka izračunajte volumen tetraedra određenog s vektorima \vec{a} , \vec{b} , \vec{c} i duljinu visine tog tetraedra spuštenu na stranu određenu s vektorima \vec{b} i \vec{c} .

a)
$$\vec{a} = (2m, 1, 1 - m), \vec{b} = (-1, 3, 0), \vec{c} = (5, -1, 8)$$

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$$< (\vec{a}, \vec{b}) = < (\vec{a}, \vec{c})$$

$$= (2m + 3)$$

$$\cos (\vec{a}, \vec{b}) = \cos (\vec{a}, \vec{c})$$

$$= (3m + 3)$$

$$\frac{\vec{a} \cdot \vec{b}}{|\vec{a}| \cdot |\vec{b}|} = \frac{\vec{a} \cdot \vec{c}}{|\vec{a}| \cdot |\vec{c}|} / |\vec{a}|$$

$$= (3m \cdot \vec{b}) = (3m \cdot \vec{c}) / |\vec{a}|$$

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a)
$$\vec{a} = (2m, 1, 1 - m), \quad \vec{b} = (-1, 3, 0), \quad \vec{c} = (5, -1, 8)$$

$$< (\vec{a}, \vec{b}) = < (\vec{a}, \vec{c})$$

$$\cos(\vec{a}, \vec{b}) = \cos(\vec{a}, \vec{c})$$

$$\frac{\vec{a} \cdot \vec{b}}{|\vec{a}| \cdot |\vec{b}|} = \frac{\vec{a} \cdot \vec{c}}{|\vec{a}| \cdot |\vec{c}|} / \cdot |\vec{a}|$$

$$\frac{\vec{a} \cdot \vec{b}}{|\vec{b}|} = \frac{\vec{a} \cdot \vec{c}}{|\vec{c}|}$$

$$\vec{a} \cdot \vec{b} = 2m \cdot (-1) + 1 \cdot 3 + (1 - m) \cdot 0 = -2m + 3$$

$$|\vec{c}| = \sqrt{5^2 + (-1)^2 + 8^2} = \sqrt{90} = 3\sqrt{10}$$

 $|\vec{b}| = \sqrt{(-1)^2 + 3^2 + 0^2} = \sqrt{10}$

 $\vec{a} \cdot \vec{c} = 2m \cdot 5 + 1 \cdot (-1) + (1-m) \cdot 8 = 2m + 7$

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$$\vec{a} = (2m, 1, 1 - m), \quad \vec{b} = (-1, 3, 0), \quad \vec{c} = (5, -1, 8)$$

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$$\cos (\vec{a}, \vec{b}) = \cos (\vec{a}, \vec{c})$$

$$\frac{\vec{a} \cdot \vec{b}}{|\vec{a}| \cdot |\vec{b}|} = \frac{\vec{a} \cdot \vec{c}}{|\vec{a}| \cdot |\vec{c}|} / \cdot |\vec{a}|$$

$$= \frac{\vec{a} \cdot \vec{b}}{|\vec{b}|} = \frac{\vec{a} \cdot \vec{c}}{|\vec{c}|}$$

$$-6m + 9$$

$$\frac{\vec{a} \cdot \vec{b}}{|\vec{b}|} = \frac{\vec{a} \cdot \vec{c}}{|\vec{c}|}$$

$$\vec{a} \cdot \vec{b} = 2m \cdot (-1) + 1 \cdot 3 + (1 - m) \cdot 0 = -2m + 3$$

$$\vec{a} \cdot \vec{c} = 2m \cdot 5 + 1 \cdot (-1) + (1 - m) \cdot 8 = 2m + 7$$

$$|\vec{b}| = \sqrt{(-1)^2 + 3^2 + 0^2} = \sqrt{10}$$

$$|\vec{c}| = \sqrt{5^2 + (-1)^2 + 8^2} = \sqrt{90} = 3\sqrt{10}$$

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Reserve
a)
$$\vec{a} = (2m, 1, 1 - m), \quad \vec{b} = (-1, 3, 0), \quad \vec{c} = (5, -1, 8)$$

$$\forall (\vec{a}, \vec{b}) = \forall (\vec{a}, \vec{c})$$

$$\cos(\vec{a}, \vec{b}) = \cos(\vec{a}, \vec{c})$$

$$\frac{\vec{a} \cdot \vec{b}}{|\vec{a}| \cdot |\vec{b}|} = \frac{\vec{a} \cdot \vec{c}}{|\vec{a}| \cdot |\vec{c}|} / \cdot |\vec{a}|$$

$$\frac{\vec{a} \cdot \vec{b}}{|\vec{b}|} = \frac{\vec{a} \cdot \vec{c}}{|\vec{c}|}$$

$$\vec{a} \cdot \vec{b} = 2m \cdot (-1) + 1 \cdot 3 + (1 - m) \cdot 0 = -2m + 3$$

$$\vec{a} \cdot \vec{c} = 2m \cdot 5 + 1 \cdot (-1) + (1 - m) \cdot 8 = 2m + 7$$

$$|\vec{b}| = \sqrt{(-1)^2 + 3^2 + 0^2} = \sqrt{10}$$

$$|\vec{c}| = \sqrt{5^2 + (-1)^2 + 8^2} = \sqrt{90} = 3\sqrt{10}$$

Appendix Reserve (a)
$$\vec{a} = (2m, 1, 1 - m), \quad \vec{b} = (-1, 3, 0), \quad \vec{c} = (5, -1, 8)$$

$$\forall (\vec{a}, \vec{b}) = \forall (\vec{a}, \vec{c})$$

$$\cos(\vec{a}, \vec{b}) = \cos(\vec{a}, \vec{c})$$

$$\frac{\vec{a} \cdot \vec{b}}{|\vec{a}| \cdot |\vec{b}|} = \frac{\vec{a} \cdot \vec{c}}{|\vec{a}| \cdot |\vec{c}|} / \cdot |\vec{a}|$$

$$-6m + 9 = 2m + 7$$

$$-8m = -2$$

$$\frac{\vec{a} \cdot \vec{b}}{|\vec{b}|} = \frac{\vec{a} \cdot \vec{c}}{|\vec{c}|}$$

$$\vec{a} \cdot \vec{b} = 2m \cdot (-1) + 1 \cdot 3 + (1 - m) \cdot 0 = -2m + 3$$

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$$|\vec{b}| = \sqrt{(-1)^2 + 3^2 + 0^2} = \sqrt{10}$$

$$|\vec{c}| = \sqrt{5^2 + (-1)^2 + 8^2} = \sqrt{90} = 3\sqrt{10}$$

a)
$$\vec{a} = (2m, 1, 1 - m), \vec{b} = (-1, 3, 0), \vec{c} = (5, -1, 8)$$

$$\sphericalangle(\vec{a}, \vec{b}) = \sphericalangle(\vec{a}, \vec{c})$$

$$\cos\left(\vec{a},\vec{b}\right) = \cos\left(\vec{a},\vec{c}\right)$$

$$(\vec{a}, \vec{c})$$

$$\frac{\vec{a} \cdot \vec{b}}{|\vec{a}| \cdot |\vec{b}|} = \frac{\vec{a} \cdot \vec{c}}{|\vec{a}| \cdot |\vec{c}|} / \cdot |\vec{a}|$$

$$\frac{\vec{a} \cdot \vec{b}}{|\vec{b}|} = \frac{\vec{a} \cdot \vec{c}}{|\vec{c}|}$$

$$\frac{-2m+3}{\sqrt{10}} = \frac{2m+7}{3\sqrt{10}} / 3\sqrt{10}$$

$$-6m+9=2m+7$$

$$|\vec{b}|$$
 $|\vec{c}|$ $|\vec{a} \cdot \vec{b} = 2m \cdot (-1) + 1 \cdot 3 + (1 - m) \cdot 0 = -2m + 3$

$$\vec{a} \cdot \vec{c} = 2m \cdot 5 + 1 \cdot (-1) + (1 - m) \cdot 8 = 2m + 7$$

$$|\vec{b}| = \sqrt{(-1)^2 + 3^2 + 0^2} = \sqrt{10}$$

$$\vec{a} = (\frac{1}{2}, 1, \frac{3}{4})$$

$$|\vec{b}| = \sqrt{(-1)^2 + 3^2 + 0^2} = \sqrt{10}$$

$$|\vec{c}| = \sqrt{5^2 + (-1)^2 + 8^2} = \sqrt{90} = 3\sqrt{10}$$

b)
$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$\vec{b} = (-1, 3, 0)$$
 $\vec{c} = (5, -1, 8)$

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$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

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$$V=rac{1}{6}ig|ig(ec{a},ec{b},ec{c}ig)ig|$$

b)
$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$\vec{b} = (-1, 3, 0)$$
 $\vec{c} = (5, -1, 8)$ $V = \frac{1}{6} |(\vec{a}, \vec{b}, \vec{c})|$

$$\left(\vec{a},\vec{b},\vec{c}\right) =% \left(\vec{a},\vec{c},\vec{c}\right) =% \left(\vec{a},\vec{c}\right) =% \left(\vec{a},\vec{c},\vec{c}\right) =% \left($$

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$$\left(ec{\pmb{a}},ec{\pmb{b}},ec{\pmb{c}}
ight) = \left|
ight.$$

b)
$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$\vec{b} = (-1, 3, 0)$$
 $\vec{c} = (5, -1, 8)$
$$V = \frac{1}{6} \left| (\vec{a}, \vec{b}, \vec{c}) \right|$$

$$\left| \frac{1}{2} \quad 1 \quad \frac{3}{4} \right|$$

$$\left(ec{a},ec{b},ec{c}
ight)=\left|egin{array}{ccc} rac{1}{2} & 1 & rac{3}{4} \end{array}
ight|$$

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$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$\vec{b} = (-1, 3, 0) \qquad \vec{c} = (5, -1, 8)$$

$$V = \frac{1}{6} |(\vec{a}, \vec{b}, \vec{c})|$$

$$(\vec{a}, \vec{b}, \vec{c}) = \begin{vmatrix} \frac{1}{2} & 1 & \frac{3}{4} \\ -1 & 3 & 0 \end{vmatrix}$$

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$$V = \frac{1}{6} | (\vec{a}, \vec{b}, \vec{c}) |$$

$$(\vec{a}, \vec{b}, \vec{c}) = \begin{vmatrix} \frac{1}{2} & 1 & \frac{3}{4} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = \frac{19}{2}$$

b)
$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$\vec{b} = (-1, 3, 0)$$
 $\vec{c} = (5, -1, 8)$ $V = \frac{1}{6} |(\vec{a}, \vec{b}, \vec{c})| = \frac{1}{6} \cdot$

$$(\vec{a}, \vec{b}, \vec{c}) = \begin{vmatrix} \frac{1}{2} & 1 & \frac{3}{4} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = \frac{19}{2}$$

b)
$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$\vec{b} = (-1, 3, 0) \qquad \vec{c} = (5, -1, 8)$$

$$V = \frac{1}{6} \left| \left(\vec{a}, \vec{b}, \vec{c} \right) \right| = \frac{1}{6} \cdot \left| \frac{19}{2} \right|$$

$$V = \frac{1}{6} |(\vec{a}, b, \vec{c})| = \frac{1}{6} \cdot |\frac{19}{2}|$$

$$(\vec{a}, \vec{b}, \vec{c}) = \begin{vmatrix} \frac{1}{2} & 1 & \frac{3}{4} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = \frac{19}{2}$$

b)
$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$\vec{b} = (-1, 3, 0)$$
 $\vec{c} = (5, -1, 8)$

$$V = \frac{1}{6} |(\vec{a}, \vec{b}, \vec{c})| = \frac{1}{6} \cdot |\frac{19}{2}| = \frac{19}{12}$$

$$|\underline{1} \quad 1 \quad \underline{3}|$$

$$(\vec{a}, \vec{b}, \vec{c}) = \begin{vmatrix} \frac{1}{2} & 1 & \frac{3}{4} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = \frac{19}{2}$$

b)
$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$V = \frac{19}{12} \quad \vec{c}$$

$$\vec{b} = (-1, 3, 0)$$
 $\vec{c} = (5, -1, 8)$

$$V = \frac{1}{6} |(\vec{a}, \vec{b}, \vec{c})| = \frac{1}{6} \cdot |\frac{19}{2}| = \frac{19}{12}$$

$$(\vec{a}, \vec{b}, \vec{c}) = \begin{vmatrix} \frac{1}{2} & 1 & \frac{3}{4} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = \frac{19}{2}$$

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$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$V = \frac{19}{12}$$

$$\vec{c}$$

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 $\vec{c} = (5, -1, 8)$

$$V = \frac{1}{6} |(\vec{a}, \vec{b}, \vec{c})| = \frac{1}{6} \cdot \left| \frac{19}{2} \right| = \frac{19}{12}$$

$$|\underline{1} \quad \underline{1} \quad \underline{3}|$$

b)
$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$V = \frac{19}{12}$$
 \vec{c}

$$\vec{b} = (-1, 3, 0)$$
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$$V = \frac{1}{6} \left| \left(\vec{a}, \vec{b}, \vec{c} \right) \right| = \frac{1}{6} \cdot \left| \frac{19}{2} \right| = \frac{19}{12}$$

$$(\vec{a}, \vec{b}, \vec{c}) = \begin{vmatrix} \frac{1}{2} & 1 & \frac{3}{4} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = \frac{19}{2}$$

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$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$V = \frac{19}{12}$$

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$$V = \frac{1}{6} \left| \left(\vec{a}, \vec{b}, \vec{c} \right) \right| = \frac{1}{6} \cdot \left| \frac{19}{2} \right| = \frac{19}{12}$$

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$$(\vec{a}, \vec{b}, \vec{c}) = \begin{vmatrix} \frac{1}{2} & 1 & \frac{3}{4} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = \frac{19}{2}$$

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$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$V = \frac{19}{12}$$

$$\vec{c}$$

$$\vec{b} = (-1, 3, 0)$$
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$$(\vec{a}, \vec{b}, \vec{c}) = \begin{vmatrix} \frac{1}{2} & 1 & \frac{3}{4} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = \frac{19}{2}$$

b)
$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$V = \frac{19}{12}$$

$$\vec{c}$$

$$V = \frac{1}{8}$$

$$\vec{b} = (-1, 3, 0)$$
 $\vec{c} = (5, -1, 8)$

$$V = \frac{1}{6} \left| \left(\vec{a}, \vec{b}, \vec{c} \right) \right| = \frac{1}{6} \cdot \left| \frac{19}{2} \right| = \frac{19}{12}$$

$$\left(\vec{a}, \vec{b}, \vec{c}\right) = \begin{vmatrix} \frac{1}{2} & 1 & \frac{3}{4} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = \frac{19}{2}$$

$$V=\frac{1}{3}Bv$$

b)
$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$V = \frac{19}{12}$$

$$\vec{c}$$

$$V = \frac{1}{3}Bv - w v = \frac{3V}{B}$$

$$\vec{b} =$$

$$\vec{b} = (-1, 3, 0)$$
 $\vec{c} = (5, -1, 8)$

$$V = \frac{1}{6} \left| \left(\vec{a}, \vec{b}, \vec{c} \right) \right| = \frac{1}{6} \cdot \left| \frac{19}{2} \right| = \frac{19}{12}$$

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b)
$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$

$$V = \frac{19}{12}$$

$$\vec{c}$$

$$V = \frac{1}{3}Bv \xrightarrow{w} v = \frac{3V}{B}$$

$$\vec{b} = (-1, 3, 0) \qquad \vec{c} = (5, -1, 8)$$

$$V = \frac{1}{6} |(\vec{a}, \vec{b}, \vec{c})| = \frac{1}{6} \cdot \left| \frac{19}{2} \right| = \frac{19}{12}$$

$$(\vec{a}, \vec{b}, \vec{c}) = \begin{vmatrix} \frac{1}{2} & 1 & \frac{3}{4} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = \frac{19}{2}$$

b)
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 $\vec{b} = (-1, 3, 0)$ $\vec{c} = (5, -1, 8)$ $V = \frac{19}{12}$ \vec{c} $V = \frac{19}{12}$ \vec{c} \vec{d} \vec{d}

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13 / 25

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b)
$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$
 $\vec{b} = (-1, 3, 0)$ $\vec{c} = (5, -1, 8)$ $V = \frac{19}{12}$ \vec{c} $V = \frac{19}{6} |(\vec{a}, \vec{b}, \vec{c})| = \frac{1}{6} \cdot \left|\frac{19}{2}\right| = \frac{19}{12}$ $\vec{d} = (\vec{a}, \vec{b}, \vec{c}) = \begin{vmatrix} \frac{1}{2} & 1 & \frac{3}{4} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = \frac{19}{2}$ $\vec{b} \times \vec{c} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = (24, 8, -14)$

 $|\vec{b} \times \vec{c}| =$

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$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$
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 $|\vec{b} \times \vec{c}| = \sqrt{24^2}$

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$$V = \frac{19}{12}$$

$$\vec{c}$$

$$V = \frac{1}{6} | (\vec{a}, \vec{b}, \vec{c}) | = \frac{1}{6} \cdot \left| \frac{19}{2} \right| = \frac{19}{12}$$

$$(\vec{a}, \vec{b}, \vec{c}) = \begin{vmatrix} \frac{1}{2} & 1 & \frac{3}{4} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = \frac{19}{2}$$

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$$|\vec{b} \times \vec{c}| = \sqrt{24^2 + 8^2 + (-14)^2}$$

$$13/25$$

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$$V = \frac{19}{12}$$

$$\vec{c}$$

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$$|\vec{b} \times \vec{c}| = \sqrt{24^2 + 8^2 + (-14)^2} = \sqrt{836} = 2\sqrt{209}$$

$$13/25$$

$$V = \frac{19}{12}$$

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$$V = \frac{1}{6} | (\vec{a}, \vec{b}, \vec{c}) | = \frac{1}{6} \cdot \left| \frac{19}{2} \right| = \frac{19}{12}$$

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$$V = \frac{1}{3}Bv \xrightarrow{\text{www}} v = \frac{3V}{B}$$

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13 / 25

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$$\vec{b} \times \vec{c} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ -1 & 3 & 0 \\ 5 & -1 & 8 \end{vmatrix} = (24, 8, -14)$$

 $|\vec{b} \times \vec{c}| = \sqrt{24^2 + 8^2 + (-14)^2} = \sqrt{836} = 2\sqrt{209}$

 $\vec{b} = (-1, 3, 0)$ $\vec{c} = (5, -1, 8)$

b) $\vec{a} = (\frac{1}{2}, 1, \frac{3}{4})$

$$V = \frac{19}{12}$$

$$\vec{c}$$

$$V = \frac{1}{6} | (\vec{a}, \vec{b}, \vec{c}) | = \frac{1}{6} \cdot \left| \frac{19}{2} \right| = \frac{19}{12}$$

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13 / 25

$$V = \frac{19}{12}$$

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$$5 -1 8$$

 $|\vec{b} \times \vec{c}| = \sqrt{24^2 + 8^2 + (-14)^2} = \sqrt{836} = 2\sqrt{209}$

 $\vec{b} = (-1, 3, 0)$ $\vec{c} = (5, -1, 8)$

13 / 25

b)
$$\vec{a} = \left(\frac{1}{2}, 1, \frac{3}{4}\right)$$
 $\vec{b} = (-1, 3, 0)$ $\vec{c} = (5, -1, 8)$ $V = \frac{19}{12}$ \vec{c} \vec{d} \vec{d}

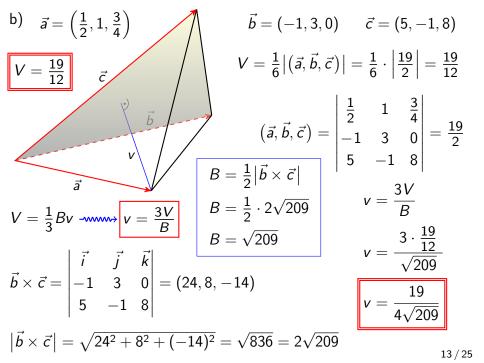
b)
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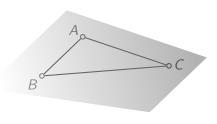
treći zadatak

Zadatak 3

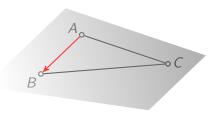
Zadane su točke A(1,2,1), B(2,3,1) i C(-2,5,3).

- a) Pokažite da je ABC pravokutni trokut s pravim kutom kod vrha A.
- b) Odredite točku D za koju je $|AD| = \sqrt{11}$ tako da vektori \overrightarrow{AB} , \overrightarrow{AC} , \overrightarrow{AD} budu međusobno okomiti i u danom poretku čine desnu bazu za V^3 .

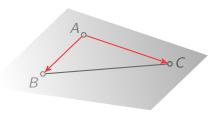
Rješenje



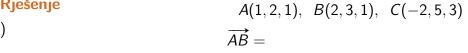
Rješenje

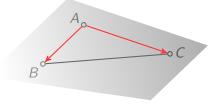


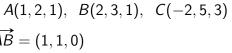
Rješenje



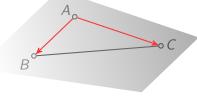
Rješenje





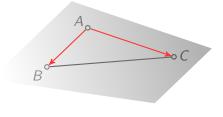




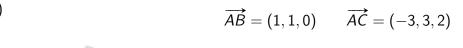


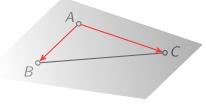
$$A(1,2,1), B(2,3,1), C(-2,5,3)$$

 $\overrightarrow{AB} = (1,1,0) \overrightarrow{AC} =$

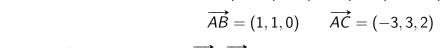


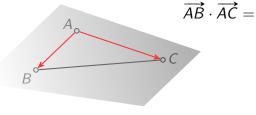
a)



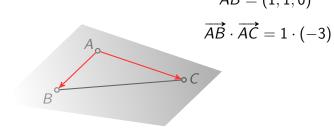


a)



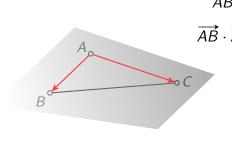


a)



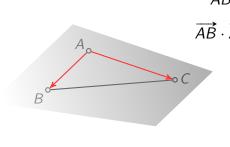
 $\overrightarrow{AB} = (1,1,0)$ $\overrightarrow{AC} = (-3,3,2)$

a)



$$\overrightarrow{AB} = (1,1,0)$$
 $\overrightarrow{AC} = (-3,3,2)$

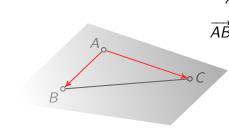
$$\overrightarrow{AB} \cdot \overrightarrow{AC} = 1 \cdot (-3) + 1 \cdot 3$$



$$A(1,2,1), B(2,3,1), C(-2,5,3)$$

 $\overrightarrow{AB} = (1,1,0) \overrightarrow{AC} = (-3,3,2)$

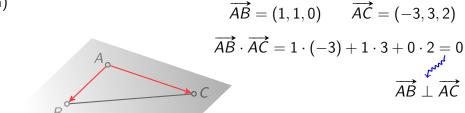
$$AC = (-3, 3, 2)$$



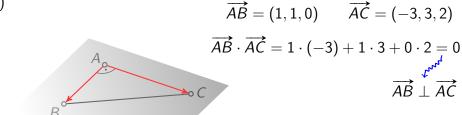
$$\overrightarrow{AB} = (1,1,0)$$
 $\overrightarrow{AC} = (-3,3,2)$

A(1,2,1), B(2,3,1), C(-2,5,3)

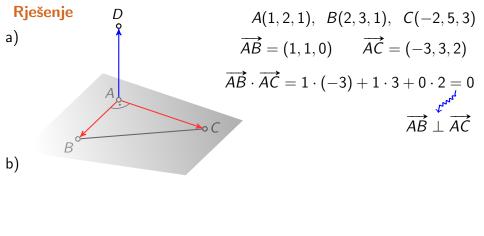
 $\overrightarrow{AB} \cdot \overrightarrow{AC} = 1 \cdot (-3) + 1 \cdot 3 + 0 \cdot 2 = 0$

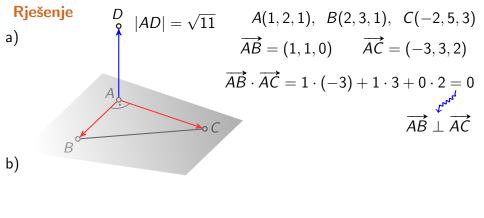


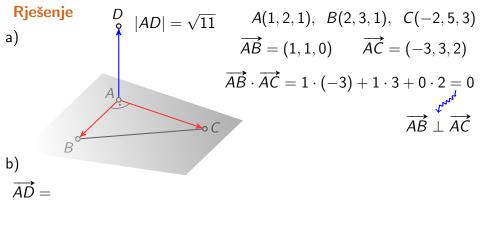
a)



A(1,2,1), B(2,3,1), C(-2,5,3)







Rješenje a)
$$\overrightarrow{AD} = \sqrt{11} \qquad A(1,2,1), \quad B(2,3,1), \quad C(-2,5,3)$$

$$\overrightarrow{AB} = (1,1,0) \qquad \overrightarrow{AC} = (-3,3,2)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AC} = 1 \cdot (-3) + 1 \cdot 3 + 0 \cdot 2 = 0$$

$$\overrightarrow{AB} \perp \overrightarrow{AC}$$
b)
$$\overrightarrow{AD} = \lambda \cdot (\overrightarrow{AB} \times \overrightarrow{AC})$$

Rješenje a)
$$|AD| = \sqrt{11}$$
 $A(1,2,1), B(2,3,1), C(-2,5,3)$ $\overrightarrow{AB} = (1,1,0)$ $\overrightarrow{AC} = (-3,3,2)$ $\overrightarrow{AB} \cdot \overrightarrow{AC} = 1 \cdot (-3) + 1 \cdot 3 + 0 \cdot 2 = 0$ $\overrightarrow{AB} \perp \overrightarrow{AC}$ b) $\overrightarrow{AD} = \lambda \cdot (\overrightarrow{AB} \times \overrightarrow{AC})$ $(\overrightarrow{AB}, \overrightarrow{AC}, \overrightarrow{AB} \times \overrightarrow{AC})$ je desna baza.

Rješenje a)
$$\overrightarrow{AD} = \sqrt{11} \qquad A(1,2,1), \quad B(2,3,1), \quad C(-2,5,3)$$

$$\overrightarrow{AB} = (1,1,0) \qquad \overrightarrow{AC} = (-3,3,2)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AC} = 1 \cdot (-3) + 1 \cdot 3 + 0 \cdot 2 = 0$$

$$\overrightarrow{AB} \perp \overrightarrow{AC}$$
b)
$$\overrightarrow{AD} = \lambda \cdot (\overrightarrow{AB} \times \overrightarrow{AC})$$

•
$$(\overrightarrow{AB}, \overrightarrow{AC}, \overrightarrow{AD})$$
 mora biti desna baza.

• $(\overrightarrow{AB}, \overrightarrow{AC}, \overrightarrow{AB} \times \overrightarrow{AC})$ je desna baza.

) mora biti desna bazi

Rješenje
a)
$$\overrightarrow{AD} = \sqrt{11}$$

$$\overrightarrow{AB} = (1, 1, 0)$$

$$\overrightarrow{AC} = (-3, 3, 2)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AC} = 1 \cdot (-3) + 1 \cdot 3 + 0 \cdot 2 = 0$$

$$\overrightarrow{AB} \perp \overrightarrow{AC}$$
b)
$$\overrightarrow{AD} = \lambda \cdot (\overrightarrow{AB} \times \overrightarrow{AC})$$

• $(\overrightarrow{AB}, \overrightarrow{AC}, \overrightarrow{AD})$ mora biti desna baza.

• $(\overrightarrow{AB}, \overrightarrow{AC}, \overrightarrow{AB} \times \overrightarrow{AC})$ je desna baza.

- Stoga je $\lambda > 0$.

Rješenje a)
$$\overrightarrow{AD} = \sqrt{11} \qquad A(1,2,1), \quad B(2,3,1), \quad C(-2,5,3)$$

$$\overrightarrow{AB} = (1,1,0) \qquad \overrightarrow{AC} = (-3,3,2)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AC} = 1 \cdot (-3) + 1 \cdot 3 + 0 \cdot 2 = 0$$

$$\overrightarrow{AB} \perp \overrightarrow{AC}$$
b)
$$\overrightarrow{AD} = \lambda \cdot (\overrightarrow{AB} \times \overrightarrow{AC}), \quad \lambda > 0$$

Rješenje a)
$$|AD| = \sqrt{11} \qquad A(1,2,1), \quad B(2,3,1), \quad C(-2,5,3)$$

$$\overrightarrow{AB} = (1,1,0) \qquad \overrightarrow{AC} = (-3,3,2)$$

$$\overrightarrow{AB} \cdot \overrightarrow{AC} = 1 \cdot (-3) + 1 \cdot 3 + 0 \cdot 2 = 0$$

$$\overrightarrow{AB} \perp \overrightarrow{AC}$$
b)
$$\overrightarrow{AD} = \lambda \cdot (\overrightarrow{AB} \times \overrightarrow{AC}), \quad \lambda > 0$$

$$\overrightarrow{AD} = A \cdot (\overrightarrow{AB} \times \overrightarrow{AC}), \quad \lambda > 0$$

Rješenje a)
$$|AD| = \sqrt{11} \qquad A(1,2,1), \quad B(2,3,1), \quad C(-2,5,3)$$

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$$\overrightarrow{AD} = \begin{vmatrix} \overrightarrow{AB} \times \overrightarrow{AC} \\ \overrightarrow{AB} \times \overrightarrow{AC} \end{vmatrix} = \sqrt{4 + 4 + 36} = 2\sqrt{11}$$

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$$\overrightarrow{AB} \times \overrightarrow{AC} = \begin{vmatrix} \overrightarrow{AB} \times \overrightarrow{AC} \\ 1 & 1 & 0 \\ -3 & 3 & 2 \end{vmatrix} = \sqrt{4+4+36} = 2\sqrt{11}$$

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$$|\overrightarrow{AB} \times \overrightarrow{AC}| = |(2,-2,6)|$$

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15/25

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b)
$$\overrightarrow{AB} \times \overrightarrow{AC} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 0 \\ -3 & 3 & 2 \end{vmatrix} = (2,-2,6)$$

$$\overrightarrow{AD} = \frac{\sqrt{11}}{|\overrightarrow{AB} \times \overrightarrow{AC}|} \cdot (\overrightarrow{AB} \times \overrightarrow{AC})$$

$$\overrightarrow{AD} = \frac{\sqrt{11}}{2\sqrt{11}} \cdot (2,-2,6)$$

$$\overrightarrow{AD} = \frac{1}{2} \cdot (2,-2,6)$$

$$\overrightarrow{AD} = (1,-1,3)$$

$$\overrightarrow{FD} = \vec{TD} = (1,-1,3)$$

$$\overrightarrow{FD} = (1,-1,3)$$

Rješenje
a)
$$|AD| = \sqrt{11} \qquad A(1,2,1), \ B(2,3,1), \ C(-2,5,3)$$

$$|\overrightarrow{AB}| = (1,1,0) \qquad |\overrightarrow{AC}| = (-3,3,2)$$

$$|\overrightarrow{AB}| \times |\overrightarrow{AC}| = |\overrightarrow{AC}| + |\overrightarrow{AB}| + |\overrightarrow{AC}|$$
b)
$$|\overrightarrow{AB}| \times |\overrightarrow{AC}| = |\overrightarrow{i}| |\overrightarrow{i}| |\overrightarrow{i}| |\overrightarrow{AB}| + |\overrightarrow{AC}| |\overrightarrow$$

Rješenje
a)
$$|AD| = \sqrt{11} \qquad A(1,2,1), \ B(2,3,1), \ C(-2,5,3)$$

$$|\overrightarrow{AB}| = (1,1,0) \qquad |\overrightarrow{AC}| = (-3,3,2)$$

$$|\overrightarrow{AB}| \cdot |\overrightarrow{AC}| = 1 \cdot (-3) + 1 \cdot 3 + 0 \cdot 2 = 0$$

$$|\overrightarrow{AB}| \times |\overrightarrow{AC}| = |\overrightarrow{i}| \qquad |\overrightarrow{i}| \qquad |\overrightarrow{i}| \qquad |\overrightarrow{AB}| \perp |\overrightarrow{AC}|$$
b)
$$|\overrightarrow{AD}| = \lambda \cdot (|\overrightarrow{AB}| \times |\overrightarrow{AC}|), \quad \lambda > 0$$

$$|\overrightarrow{AD}| = \frac{\sqrt{11}}{|\overrightarrow{AB}| \times |\overrightarrow{AC}|} \cdot (|\overrightarrow{AB}| \times |\overrightarrow{AC}|)$$

$$|\overrightarrow{AD}| = \frac{\sqrt{11}}{2\sqrt{11}} \cdot (2, -2, 6)$$

$$|\overrightarrow{AD}| = \frac{1}{2} \cdot (2, -2, 6)$$

$$|\overrightarrow{AD}| = (1, -1, 3)$$

$$|\overrightarrow{r_D}| = |\overrightarrow{r_A}| + (1, -1, 3)$$

Rješenje
a)
$$|AD| = \sqrt{11} \qquad A(1,2,1), \ B(2,3,1), \ C(-2,5,3)$$

$$|\overrightarrow{AB}| = (1,1,0) \qquad \overrightarrow{AC} = (-3,3,2)$$

$$|\overrightarrow{AB}| \cdot \overrightarrow{AC}| = 1 \cdot (-3) + 1 \cdot 3 + 0 \cdot 2 = 0$$

$$|\overrightarrow{AB}| \times |\overrightarrow{AC}| = |\overrightarrow{i}| \qquad |\overrightarrow{i}| \qquad |\overrightarrow{i}| \qquad |\overrightarrow{AB}| \perp |\overrightarrow{AC}|$$
b)
$$|\overrightarrow{AD}| = \lambda \cdot (|\overrightarrow{AB}| \times |\overrightarrow{AC}|), \quad \lambda > 0$$

$$|\overrightarrow{AD}| = \frac{\sqrt{11}}{|\overrightarrow{AB}| \times |\overrightarrow{AC}|} \cdot (|\overrightarrow{AB}| \times |\overrightarrow{AC}|)$$

$$|\overrightarrow{AD}| = \frac{\sqrt{11}}{2\sqrt{11}} \cdot (2, -2, 6)$$

$$|\overrightarrow{AD}| = \frac{1}{2} \cdot (2, -2, 6)$$

$$|\overrightarrow{AD}| = (1, -1, 3)$$

$$|\overrightarrow{CD}| = (1, -1, 3)$$

Rješenje
a)
$$|AD| = \sqrt{11} \qquad A(1,2,1), \ B(2,3,1), \ C(-2,5,3)$$

$$|\overrightarrow{AB}| = (1,1,0) \qquad \overrightarrow{AC} = (-3,3,2)$$

$$|\overrightarrow{AB}| \cdot \overrightarrow{AC}| = 1 \cdot (-3) + 1 \cdot 3 + 0 \cdot 2 = 0$$

$$|\overrightarrow{AB}| \times |\overrightarrow{AC}| = |\overrightarrow{i}| \qquad |\overrightarrow{i}| \qquad |\overrightarrow{i}| \qquad |\overrightarrow{AB}| \perp |\overrightarrow{AC}|$$
b)
$$|\overrightarrow{AD}| = \lambda \cdot (|\overrightarrow{AB}| \times |\overrightarrow{AC}|), \quad \lambda > 0$$

$$|\overrightarrow{AD}| = \frac{\sqrt{11}}{|\overrightarrow{AB}| \times |\overrightarrow{AC}|} \cdot (|\overrightarrow{AB}| \times |\overrightarrow{AC}|)$$

$$|\overrightarrow{AD}| = \frac{\sqrt{11}}{2\sqrt{11}} \cdot (2, -2, 6)$$

$$|\overrightarrow{AD}| = \frac{1}{2} \cdot (2, -2, 6)$$

$$|\overrightarrow{AD}| = (1, -1, 3)$$

$$|\overrightarrow{CD}| = (1, 2, 1) + (1, -1, 3)$$

$$|\overrightarrow{CD}| = (2, 1, 4)$$

$$|\overrightarrow{CD}| = (2, 1, 4)$$

$$|\overrightarrow{CD}| = (2, 1, 4)$$

Rješenje
a)
$$|AD| = \sqrt{11} \qquad A(1,2,1), \ B(2,3,1), \ C(-2,5,3)$$

$$|\overrightarrow{AB}| = (1,1,0) \qquad \overrightarrow{AC} = (-3,3,2)$$

$$|\overrightarrow{AB} \cdot \overrightarrow{AC}| = 1 \cdot (-3) + 1 \cdot 3 + 0 \cdot 2 = 0$$

$$|\overrightarrow{AB} \times \overrightarrow{AC}| = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & 0 \\ -3 & 3 & 2 \end{vmatrix} = (2,-2,6)$$

$$|\overrightarrow{AB} \times \overrightarrow{AC}| = \sqrt{4+4+36} = 2\sqrt{11}$$

$$|\overrightarrow{AD}| = \frac{\sqrt{11}}{|\overrightarrow{AB} \times \overrightarrow{AC}|} \cdot (\overrightarrow{AB} \times \overrightarrow{AC})$$

$$|\overrightarrow{AD}| = \frac{\sqrt{11}}{2\sqrt{11}} \cdot (2,-2,6)$$

$$|\overrightarrow{AD}| = \frac{1}{2} \cdot (2,-2,6)$$

$$|\overrightarrow{AD}| = \frac{1}{2} \cdot (2,-2,6)$$

$$|\overrightarrow{AD}| = (1,-1,3)$$

$$|\overrightarrow{C}| = (1,2,1) + (1,-1,3)$$

$$|\overrightarrow{C}| = (2,1,4)$$

$$|\overrightarrow{C}| = (2,1,4)$$

Rješenje
a)
$$|AD| = \sqrt{11} \qquad A(1,2,1), \quad B(2,3,1), \quad C(-2,5,3)$$

$$|\overrightarrow{AB}| = (1,1,0) \qquad |\overrightarrow{AC}| = (-3,3,2)$$

$$|\overrightarrow{AB}| \cdot |\overrightarrow{AC}| = 1 \cdot (-3) + 1 \cdot 3 + 0 \cdot 2 = 0$$

$$|\overrightarrow{AB}| \times |\overrightarrow{AC}| = |\overrightarrow{i}| \qquad |\overrightarrow{i}| \qquad |\overrightarrow{i}| \qquad |\overrightarrow{AB}| \perp |\overrightarrow{AC}|$$
b)
$$|\overrightarrow{AD}| = \lambda \cdot (|\overrightarrow{AB}| \times |\overrightarrow{AC}|), \quad \lambda > 0$$

$$|\overrightarrow{AD}| = \frac{\sqrt{11}}{|\overrightarrow{AB}| \times |\overrightarrow{AC}|} \cdot (|\overrightarrow{AB}| \times |\overrightarrow{AC}|)$$

$$|\overrightarrow{AD}| = \frac{\sqrt{11}}{2\sqrt{11}} \cdot (2, -2, 6)$$

$$|\overrightarrow{AD}| = \frac{1}{2} \cdot (2, -2, 6)$$

$$|\overrightarrow{AD}| = \frac{1}{2} \cdot (2, -2, 6)$$

$$|\overrightarrow{AD}| = (1, -1, 3)$$

$$|\overrightarrow{CD}| = (1, 2, 1) + (1, -1, 3)$$

$$|\overrightarrow{CD}| = (1, 2, 1) + (1, -1, 3)$$

$$|\overrightarrow{CD}| = (2, 1, 4)$$

$$|\overrightarrow{CD}| = (2, 1, 4)$$

četvrti zadatak

Zadatak 4

Zadana je dužina \overline{AB} s koordinatama svojih krajeva A(3,4,1) i B(-5,2,-3).

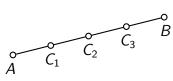
- a) Točkama C_1 , C_2 i C_3 dužina \overline{AB} je podijeljena na četiri jednaka dijela. Odredite koordinate točaka C_1 , C_2 i C_3 .
- b) Odredite na pravcu AB točku D za koju je točka A polovište dužine $\overline{C_1D}$.

Rješenje a)



Rješenje

a)



o B

$$\overrightarrow{AB} =$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} =$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$



A(3,4,1)

B(-5,2,-3)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_{C_1}} - \overrightarrow{r_A}$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$
 $\vec{r}_{C_1} - \vec{r}_A = \frac{1}{4}\overrightarrow{AB}$

$$C_1$$
 C_2 C_3 C_3

B(-5,2,-3)

A(3,4,1)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$

 $\overrightarrow{r}_{C_1} - \overrightarrow{r}_A = \frac{1}{4}\overrightarrow{AB}$

$$\vec{r}_{C_1} =$$

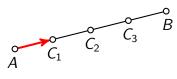
A(3,4,1)

B(-5,2,-3)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$
 $\vec{r}_{C_1} - \vec{r}_A = \frac{1}{4}\overrightarrow{AB}$
 $\vec{r}_{C_1} = \vec{r}_A + \frac{1}{4}\overrightarrow{AB}$

$$A(3,4,1)$$
 $B(-5,2,-3)$

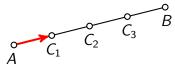


$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$
 $\vec{r}_{C_1} - \vec{r}_A = \frac{1}{4}\overrightarrow{AB}$

$$\vec{r}_{C_1} = \vec{r}_A + \frac{1}{4} \overrightarrow{AB}$$

$$A(3,4,1)$$
 $B(-5,2,-3)$



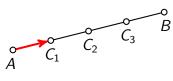
$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$
 $\overrightarrow{r_{C_1}} - \overrightarrow{r_A} = \frac{1}{4}\overrightarrow{AB}$

$$\vec{r}_{C_1} = \vec{r}_A + \frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_1} =$$

$$A(3,4,1)$$
 $B(-5,2,-3)$



$$\overrightarrow{AB} = (-8, -2, -4)$$

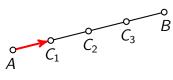
$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_{C_1}} - \overrightarrow{r_A} = \frac{1}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_1} = \vec{r}_A + \frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_1} = (3, 4, 1)$$

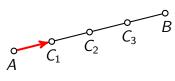
$$A(3,4,1)$$
 $B(-5,2,-3)$



$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$
 $\overrightarrow{r_{C_1}} - \overrightarrow{r_A} = \frac{1}{4}\overrightarrow{AB}$
 $\overrightarrow{r_{C_1}} = \overrightarrow{r_A} + \frac{1}{4}\overrightarrow{AB}$

$$\vec{r}_{C_1} = (3,4,1) + \frac{1}{4}$$



$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$
 $\vec{r}_{C_1} - \vec{r}_A = \frac{1}{4}\overrightarrow{AB}$

$$\vec{r}_{C_1} = \vec{r}_A + \frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_1} = (3,4,1) + \frac{1}{4} \cdot (-8,-2,-4)$$

$$C_1$$
 C_2 C_3 C_3

A(3,4,1)

B(-5, 2, -3)

$$\overrightarrow{AB} = (-8, -2, -4)$$

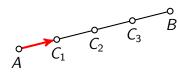
$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$
 $\vec{r}_{C_1} - \vec{r}_A = \frac{1}{4}\overrightarrow{AB}$

$$\vec{r}_{C_1} = \vec{r}_A + \frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_1} = (3,4,1) + \frac{1}{4} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_1} =$$

$$A(3,4,1)$$
 $B(-5,2,-3)$



$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$
 $\overrightarrow{r_{C_1}} - \overrightarrow{r_A} = \frac{1}{4}\overrightarrow{AB}$
 $\overrightarrow{r_{C_1}} = \overrightarrow{r_A} + \frac{1}{4}\overrightarrow{AB}$

$$\vec{r}_{C_1} = (3,4,1) + \frac{1}{4} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_1} = (3,4,1) +$$

$$A(3,4,1)$$
 $B(-5,2,-3)$

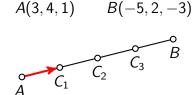
$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$
 $\vec{r}_{C_1} - \vec{r}_A = \frac{1}{4}\overrightarrow{AB}$

$$\vec{r}_{C_1} = \vec{r}_A + \frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_1} = (3,4,1) + \frac{1}{4} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_1} = (3,4,1) + \left(-2, -\frac{1}{2}, -1\right)$$



$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_{C_1}} - \overrightarrow{r_A} = \frac{1}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_1} = \vec{r}_A + \frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_1} = (3,4,1) + \frac{1}{4} \cdot (-8,-2,-4)$$
 $\vec{r}_{C_1} = (3,4,1) + \left(-2,-\frac{1}{2},-1\right)$

$$\vec{r}_{C_1} =$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_{C_1}} - \overrightarrow{r_A} = \frac{1}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_1} = \vec{r}_A + \frac{1}{4} \overrightarrow{AB}$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\vec{r}_{C_1} = (3, 4, 1) + \frac{1}{4} \cdot (-8, -2, -4)$$
 $\vec{r}_{C_1} = (3, 4, 1) + \left(-2, -\frac{1}{2}, -1\right)$
 $\vec{r}_{C_1} = \left(1, \frac{7}{2}, 0\right)$

$$\overrightarrow{AC_1} = \frac{1}{4}\overrightarrow{AB}$$
 $\vec{r}_{C_1} - \vec{r}_A = \frac{1}{4}\overrightarrow{AB}$

$$\vec{r}_{C_1} = \vec{r}_A + \frac{1}{4} \overrightarrow{AB}$$

 $\vec{r}_{C_1} = \left(1, \frac{7}{2}, 0\right)$

$$\vec{r}_{C_1} = (3, 4, 1) + \frac{1}{4} \cdot (-8, -2, -4)$$

$$\vec{r}_{C_1} = (3, 4, 1) + \left(-2, -\frac{1}{2}, -1\right)$$

 C_1 C_2 C_3 C_3

B(-5, 2, -3)

A(3,4,1)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$A C_1 C_2 C_3$$

A(3,4,1)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

B(-5,2,-3)

$$\overrightarrow{AC_2} =$$

$$A$$
 C_1 C_2 C_3 E

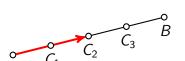
A(3,4,1)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

B(-5,2,-3)

$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$

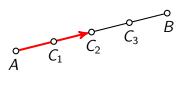


A(3,4,1)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$
 $\vec{r}_{C_2} - \vec{r}_A$



A(3,4,1)

$$\overrightarrow{AB} = (-8, -2, -4)$$
 $C_1\left(1, \frac{7}{2}, 0\right)$

$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$
 $\overrightarrow{r}_{C_2} - \overrightarrow{r}_A = \frac{1}{2}\overrightarrow{AB}$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$
 $\vec{r}_{C_2} - \vec{r}_A = \frac{1}{2}\overrightarrow{AB}$

$$\vec{r}_{C_2} =$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$
 $\vec{r}_{C_2} - \vec{r}_A = \frac{1}{2}\overrightarrow{AB}$

$$=\frac{1}{2}\overrightarrow{AB}$$

$$\vec{r}_{C_2} = \vec{r}_A + \frac{1}{2} \overrightarrow{AB}$$

$$A(3,4,1)$$
 $B(-5,2,-3)$

$$\overrightarrow{AB} = (-8, -2, -4)$$

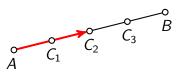
$$C_1\left(1,\frac{7}{2},0\right)$$

$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$

$$\vec{r}_{C_2} - \vec{r}_A = \frac{1}{2} \overrightarrow{AB}$$

$$\vec{r}_{C_2} = \vec{r}_A + \frac{1}{2} \overrightarrow{AB}$$

$$A(3,4,1)$$
 $B(-5,2,-3)$



$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$
 $\vec{r}_{C_2} - \vec{r}_A = \frac{1}{2}\overrightarrow{AB}$

$$\vec{r}_{C_2} = \vec{r}_A + \frac{1}{2} \overrightarrow{AB}$$

$$\vec{r}_{C_2} =$$

$$A(3,4,1)$$
 $B(-5,2,-3)$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

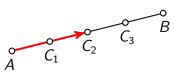
$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$

$$\vec{r}_{C_2} - \vec{r}_A = \frac{1}{2} \overrightarrow{AB}$$

$$\vec{r}_{C_2} = \vec{r}_A + \frac{1}{2} \overrightarrow{AB}$$

$$\vec{r}_{C_2} = (3,4,1)$$

$$A(3,4,1)$$
 $B(-5,2,-3)$



$$\overrightarrow{AB} = (-8, -2, -4)$$

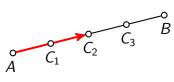
$$C_1\left(1,\frac{7}{2},0\right)$$

$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$
 $\vec{r}_{C_2} - \vec{r}_A = \frac{1}{2}\overrightarrow{AB}$

$$\vec{r}_{C_2} = \vec{r}_A + \frac{1}{2} \overrightarrow{AB}$$

$$\vec{r}_{C_2} = (3,4,1) + \frac{1}{2}$$

$$A(3,4,1)$$
 $B(-5,2,-3)$



$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$
 $\vec{r}_{C_2} - \vec{r}_A = \frac{1}{2}\overrightarrow{AB}$

$$\vec{r}_{C_2} = \vec{r}_A + \frac{1}{2} \overrightarrow{AB}$$

$$\vec{r}_{C_2} = (3,4,1) + \frac{1}{2} \cdot (-8,-2,-4)$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$
 $\vec{r}_{C_2} - \vec{r}_A = \frac{1}{2}\overrightarrow{AB}$

$$\vec{r}_{C_2} = \vec{r}_A + \frac{1}{2} \overrightarrow{AB}$$

$$\vec{r}_{C_2} = (3,4,1) + \frac{1}{2} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_2} =$$

B(-5,2,-3)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

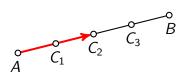
$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$

$$\overrightarrow{r}_{C_2} - \overrightarrow{r}_A = \frac{1}{2}\overrightarrow{AB}$$

$$\vec{r}_{C_2} = \vec{r}_A + \frac{1}{2} \overrightarrow{AB}$$

$$\vec{r}_{C_2} = (3,4,1) + \frac{1}{2} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_2} = (3,4,1) +$$



B(-5, 2, -3)

$$\overrightarrow{AB} = (-8, -2, -4)$$

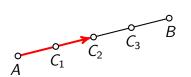
$$C_1\left(1,\frac{7}{2},0\right)$$

$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$
 $\vec{r}_{C_2} - \vec{r}_A = \frac{1}{2}\overrightarrow{AB}$

$$\vec{r}_{C_2} = \vec{r}_A + \frac{1}{2} \overrightarrow{AB}$$

$$\vec{r}_{C_2} = (3,4,1) + \frac{1}{2} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_2} = (3,4,1) + (-4,-1,-2)$$



$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

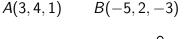
$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$
 $\vec{r}_{C_2} - \vec{r}_A = \frac{1}{2}\overrightarrow{AB}$

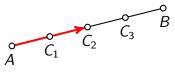
$$\vec{r}_{C_2} = \vec{r}_A + \frac{1}{2} \overrightarrow{AB}$$

$$\vec{r}_{C_2} = (3,4,1) + \frac{1}{2} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_2} = (3,4,1) + (-4,-1,-2)$$

$$\vec{r}_{C_2} =$$





$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

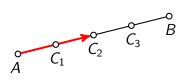
$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$
 $\vec{r}_{C_2} - \vec{r}_A = \frac{1}{2}\overrightarrow{AB}$

$$\vec{r}_{C_2} = \vec{r}_A + \frac{1}{2} \overrightarrow{AB}$$

$$\vec{r}_{C_2} = (3,4,1) + \frac{1}{2} \cdot (-8,-2,-4)$$

 $\vec{r}_{C_2} = (3,4,1) + (-4,-1,-2)$

$$\vec{r}_{C_2} = (-1, 3, -1)$$



B(-5, 2, -3)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

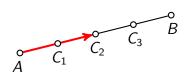
$$\overrightarrow{AC_2} = \frac{1}{2}\overrightarrow{AB}$$
 $\vec{r}_{C_2} - \vec{r}_A = \frac{1}{2}\overrightarrow{AB}$

$$\vec{r}_{C_2} = \vec{r}_A + \frac{1}{2} \overrightarrow{AB}$$

$$\vec{r}_{C_2} = (3,4,1) + \frac{1}{2} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_2} = (3,4,1) + (-4,-1,-2)$$

$$\vec{r}_{C_2} = (-1, 3, -1)$$



B(-5, 2, -3)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$C_2(-1,3,-1)$$

A(3,4,1)

$$\overrightarrow{AB} = (-8, -2, -4)$$
 $C_1\left(1, \frac{7}{2}, 0\right)$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$\overrightarrow{AC_3} =$$

$$C_1$$
 C_2 C_3 C_3

A(3,4,1) B(-5,2,-3)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1, \frac{7}{2}, 0\right)$$

$$C_2(-1, 3, -1)$$

 $C_1\left(1,\frac{7}{2},0\right)$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

$$A$$
 C_1 C_2 C_3 B

B(-5,2,-3)

A
$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1, \frac{7}{2}, 0\right)$$

$$C_2(-1, 3, -1)$$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

$$\overrightarrow{r}_{C_3} - \overrightarrow{r}_A$$

 $\overrightarrow{AB} = (-8, -2, -4)$

 $C_1(1,\frac{7}{2},0)$

A(3,4,1) B(-5,2,-3)

$$C_2(-1,3,-1)$$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

$$\overrightarrow{r}_{C_3} - \overrightarrow{r}_A = \frac{3}{4}\overrightarrow{AB}$$

B(-5,2,-3)

$$C_1\left(1, \frac{7}{2}, 0\right)$$
 $C_2(-1, 3, -1)$

 $\overrightarrow{AB} = (-8, -2, -4)$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

$$\overrightarrow{r}_{C_3} - \overrightarrow{r}_A = \frac{3}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_3} =$$

$$C_1$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1, \frac{7}{2}, 0\right)$$
 $C_2(-1, 3, -1)$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_3} - \vec{r}_A = \frac{3}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_3} = \vec{r}_A + \frac{3}{4} \overrightarrow{AB}$$

A(3,4,1) B(-5,2,-3)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$C_2(-1,3,-1)$$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_3} - \vec{r}_A = \frac{3}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_3} = \vec{r}_A + \frac{3}{4} \overrightarrow{AB}$$

B(-5,2,-3)

$$A$$
 C_1 C_2 C_3 C_3

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

$$\overrightarrow{r}_{C_3} - \overrightarrow{r}_A = \frac{3}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_3} = \vec{r}_A + \frac{3}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_3} =$$

B(-5,2,-3)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1, \frac{7}{2}, 0\right)$$
 $C_2(-1, 3, -1)$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_3} - \vec{r}_A = \frac{3}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_3} = \vec{r}_A + \frac{3}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_3} = (3,4,1)$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1, \frac{7}{2}, 0\right)$$
 $C_2(-1, 3, -1)$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$
$$\overrightarrow{r}_{C_3} - \overrightarrow{r}_A = \frac{3}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_3} = \vec{r}_A + \frac{3}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_3} = (3,4,1) + \frac{3}{4}$$

A(3,4,1) B(-5,2,-3)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1, \frac{7}{2}, 0\right)$$
 $C_2(-1, 3, -1)$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

$$\overrightarrow{r}_{C_3} - \overrightarrow{r}_A = \frac{3}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_3} = \vec{r}_A + \frac{3}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_3} = (3,4,1) + \frac{3}{4} \cdot (-8,-2,-4)$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

 $C_2(-1,3,-1)$

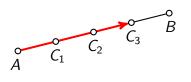
$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

$$\overrightarrow{r}_{C_3} - \overrightarrow{r}_A = \frac{3}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_3} = \vec{r}_A + \frac{3}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_3} = (3,4,1) + \frac{3}{4} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_3} =$$



$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

 $C_2(-1,3,-1)$

$$L_2(-1,3,-1)$$

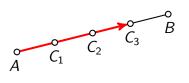
$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

$$\overrightarrow{r}_{C_3} - \overrightarrow{r}_A = \frac{3}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_3} = \vec{r}_A + \frac{3}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_3} = (3,4,1) + \frac{3}{4} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_3} = (3,4,1) +$$



$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$C_2(-1,3,-1)$$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

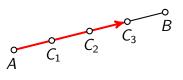
$$\overrightarrow{r}_{C_3} - \overrightarrow{r}_A = \frac{3}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_3} = \vec{r}_A + \frac{3}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_3} = (3,4,1) + \frac{3}{4} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_3} = (3,4,1) + \left(-6, -\frac{3}{2}, -3\right)$$

$$A(3,4,1)$$
 $B(-5,2,-3)$



$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1, \frac{7}{2}, 0\right)$$

 $C_2(-1, 3, -1)$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

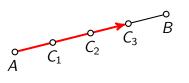
$$\overrightarrow{r_{C_3}} - \overrightarrow{r_A} = \frac{3}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_3} = \vec{r}_A + \frac{3}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_3} = (3,4,1) + \frac{3}{4} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_3} = (3,4,1) + \left(-6, -\frac{3}{2}, -3\right)$$

$$\vec{r}_{C_3} =$$



B(-5,2,-3)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$C_2(-1,3,-1)$$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

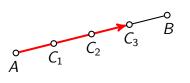
$$\overrightarrow{r}_{C_3} - \overrightarrow{r}_A = \frac{3}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_3} = \vec{r}_A + \frac{3}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_3} = (3,4,1) + \frac{3}{4} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_3} = (3,4,1) + \left(-6, -\frac{3}{2}, -3\right)$$

$$\vec{r}_{C_3} = \left(-3, \frac{5}{2}, -2\right)$$



B(-5, 2, -3)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$C_2(-1,3,-1)$$

$$\overrightarrow{AC_3} = \frac{3}{4}\overrightarrow{AB}$$

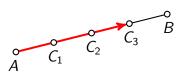
$$\overrightarrow{r}_{C_3} - \overrightarrow{r}_A = \frac{3}{4}\overrightarrow{AB}$$

$$\vec{r}_{C_3} = \vec{r}_A + \frac{3}{4} \overrightarrow{AB}$$

$$\vec{r}_{C_3} = (3,4,1) + \frac{3}{4} \cdot (-8,-2,-4)$$

$$\vec{r}_{C_3} = (3,4,1) + \left(-6, -\frac{3}{2}, -3\right)$$

$$\vec{r}_{C_3} = \left(-3, \frac{5}{2}, -2\right)$$



$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

 $C_2(-1,3,-1)$

$$C_3\left(-3,\frac{5}{2},-2\right)$$

b)

$$C_1$$
 C_2 C_3 E

A(3,4,1)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1 \left(1, \frac{7}{2}, 0\right)$$

$$C_2(-1, 3, -1)$$

$$C_3\left(-3,\frac{5}{2},-2\right)$$

b)

$$C_1$$
 C_2 C_3 C_4

A(3,4,1)

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1, \frac{7}{2}, 0\right)$$

$$C_2(-1, 3, -1)$$

$$C_3\left(-3,\frac{5}{2},-2\right)$$

b)

A(3,4,1)

$$\overrightarrow{AB} = (-8, -2, -4)$$
 $C_1\left(1, \frac{7}{2}, 0\right)$

$$C_2(-1,3,-1)$$
 $C_3\left(-3,\frac{5}{2},-2\right)$

b) $\overrightarrow{AD} = A(3,4,1) \quad B(-5,2,-3)$

$$\overrightarrow{AB} = (-8, -2, -4)$$
 $C_1\left(1, \frac{7}{2}, 0\right)$

$$C_2(-1,3,-1)$$
 $C_3(-3,\frac{5}{2},-2)$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$C_1(1, \frac{1}{2}, 0)$$
 $C_2(-1, 3, -1)$

$$C_3\left(-3,\frac{5}{2},-2\right)$$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A}$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

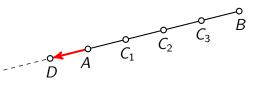
$$C_1\left(1, \frac{7}{2}, 0\right)$$

$$C_2(-1,3,-1)$$

$$C_3\left(-3,\frac{5}{2},-2\right)$$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$
 $\overrightarrow{r_D} - \overrightarrow{r_A} = -\frac{1}{4}\overrightarrow{AB}$

$$\frac{1}{4}\overrightarrow{AB}$$



$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$C_2(-1,3,-1)$$

$$C_3\left(-3,\frac{5}{2},-2\right)$$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$
 $\overrightarrow{r_D} - \overrightarrow{r_A} = -\frac{1}{4}\overrightarrow{AB}$

$$\vec{r}_D =$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$C_2(-1,3,-1)$$

$$C_3\left(-3,\frac{5}{2},-2\right)$$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$

$$\vec{r}_D - \vec{r}_A = -\frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_D = \vec{r}_A - \frac{1}{4} \overrightarrow{AB}$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$C_2(-1,3,-1)$$

$$,\frac{5}{2},-2$$

$$\textit{C}_{3}\!\left(-3,\frac{5}{2},-2\right)$$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$

$$\vec{r}_D - \vec{r}_A = -\frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_D = \vec{r}_A - \frac{1}{4} \overrightarrow{AB}$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$C_2(-1,3,-1)$$

$$C_3\left(-3,\frac{5}{2},-2\right)$$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$

$$\vec{r}_D - \vec{r}_A = -\frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_D = \vec{r}_A - \frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_D =$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$C_3\left(-3,\frac{5}{2},-2\right)$$

 $C_2(-1,3,-1)$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$

$$\vec{r}_D - \vec{r}_A = -\frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_D = \vec{r}_A - \frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_D = (3, 4, 1)$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$C_3\left(-3,\frac{5}{2},-2\right)$$

 $C_2(-1,3,-1)$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$

$$\vec{r}_D - \vec{r}_A = -\frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_D = \vec{r}_A - \frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_D = (3,4,1) - \frac{1}{4}$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

$$C_2(-1,3,-1)$$

$$C_3\left(-3,\frac{5}{2},-2\right)$$

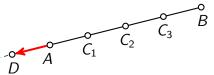
$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$
$$\overrightarrow{r_D} - \overrightarrow{r_A} = -\frac{1}{4}\overrightarrow{AB}$$

$$\vec{r}_D = \vec{r}_A - \frac{1}{4} \overrightarrow{AB}$$

$$r_A = r_A - \frac{1}{4}AB$$

$$\vec{r}_D = (3,4,1) - \frac{1}{4} \cdot (-8,-2,-4)$$

$$A(3,4,1)$$
 $B(-5,2,-3)$



$$\overrightarrow{AB} = (-8, -2, -4)$$

$$C_1\left(1,\frac{7}{2},0\right)$$

 $C_2(-1,3,-1)$

$$C_3\left(-3,\frac{5}{2},-2\right)$$

$$A(3,4,1)$$
 $B(-5,2,-3)$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = -\frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{r_D} = (3, 4, 1) - \frac{1}{4} \cdot (-8, -2, -4)$$

$$\overrightarrow{r_D} = C_3(-1, 3, -1)$$

$$\overrightarrow{r_D} = C_3(-3, \frac{5}{2}, -2)$$

$$A(3,4,1)$$
 $B(-5,2,-3)$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = -\frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{r_D} = (3, 4, 1) - \frac{1}{4} \cdot (-8, -2, -4)$$

$$\overrightarrow{r_D} = (3, 4, 1) +$$

$$C_1\left(1, \frac{7}{2}, 0\right)$$

$$C_2(-1, 3, -1)$$

$$C_3\left(-3, \frac{5}{2}, -2\right)$$

$$A(3,4,1)$$
 $B(-5,2,-3)$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = -\frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{r_D} = (3, 4, 1) - \frac{1}{4} \cdot (-8, -2, -4)$$

$$\overrightarrow{r_D} = (3, 4, 1) + \left(2, \frac{1}{2}, 1\right)$$

$$C_3\left(-3, \frac{5}{2}, -2\right)$$

$$A(3,4,1)$$
 $B(-5,2,-3)$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = -\frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\overrightarrow{r_D} = (3, 4, 1) - \frac{1}{4} \cdot (-8, -2, -4)$$

$$\overrightarrow{r_D} = (3, 4, 1) + \left(2, \frac{1}{2}, 1\right)$$

$$\overrightarrow{r_D} =$$

$$C_1\left(1, \frac{7}{2}, 0\right)$$

$$C_2(-1, 3, -1)$$

$$C_3\left(-3, \frac{5}{2}, -2\right)$$

$$\overrightarrow{r_D} =$$

$$A(3,4,1)$$
 $B(-5,2,-3)$

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = -\frac{1}{4}\overrightarrow{AB}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} - \frac{1}{4}\overrightarrow{AB}$$

$$\vec{r}_D = (3, 4, 1) - \frac{1}{4} \cdot (-8, -2, -4)$$
 $\vec{r}_D = (3, 4, 1) + \left(2, \frac{1}{2}, 1\right)$
 $\vec{r}_D = \left(5, \frac{9}{2}, 2\right)$

$$C_1\left(1, \frac{7}{2}, 0\right)$$

 $C_2(-1, 3, -1)$

 $\overrightarrow{AB} = (-8, -2, -4)$

$$C_3\left(-3,\frac{5}{2},-2\right)$$

$$A(3,4,1) \qquad B(-5,2,-3)$$
b)

$$\overrightarrow{AD} = -\frac{1}{4}\overrightarrow{AB}$$
 $\overrightarrow{r_D} - \overrightarrow{r_A} = -\frac{1}{4}\overrightarrow{AB}$

$$\overrightarrow{AB}$$

$$\overrightarrow{AB} = (-8, -2, -4)$$

$$\vec{r}_D = \vec{r}_A - \frac{1}{4} \overrightarrow{AB}$$

$$\vec{r}_D = (3, 4, 1)$$

$$\vec{r}_D = (3,4,1) - \frac{1}{4} \cdot (-8,-2,-4)$$

$$C_1\left(1, \frac{7}{2}, 0\right)$$

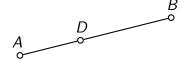
 $C_2(-1, 3, -1)$

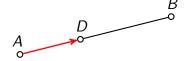
$$\vec{r}_D = (3, 4, 1) + (2, \frac{1}{2}, 1)$$
 $\vec{r}_D = (5, 9, 2)$

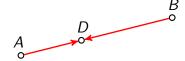
$$C_3\left(-3,\frac{5}{2},-2\right)$$

$$\vec{r}_D = \left(5, \frac{9}{2}, 2\right)$$

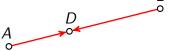
Koordinate djelišne točke



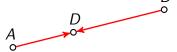




$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

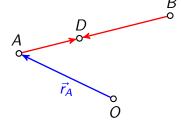


$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

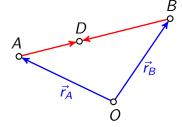




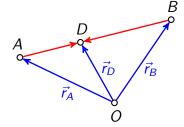
$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$



$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

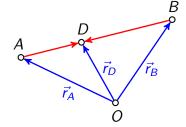


$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

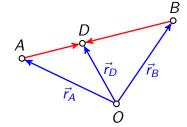


$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

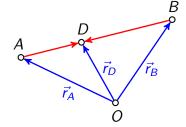
$$\overrightarrow{r_D} - \overrightarrow{r_A} =$$



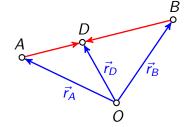
$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$
 $\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_D - \vec{r}_B)$



$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$
 $\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_D - \vec{r}_B)$
 $\vec{r}_D - \vec{r}_A =$



$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$
 $\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_D - \vec{r}_B)$
 $\vec{r}_D - \vec{r}_A = \lambda \vec{r}_D - \lambda \vec{r}_B$

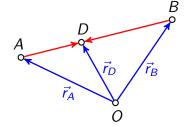


$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_D - \vec{r}_B)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_D - \lambda \vec{r}_B$$

$$\vec{r}_D - \lambda \vec{r}_D =$$

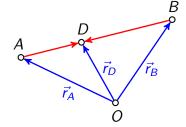


$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_D - \vec{r}_B)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_D - \lambda \vec{r}_B$$

$$\vec{r}_D - \lambda \vec{r}_D = \vec{r}_A - \lambda \vec{r}_B$$



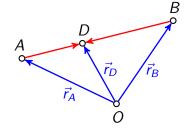
$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_D - \vec{r}_B)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_D - \lambda \vec{r}_B$$

$$\vec{r}_D - \lambda \vec{r}_D = \vec{r}_A - \lambda \vec{r}_B$$

$$(1 - \lambda)\vec{r}_D =$$



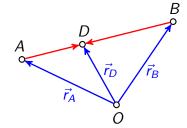
$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

$$\overrightarrow{r}_D - \overrightarrow{r}_A = \lambda (\overrightarrow{r}_D - \overrightarrow{r}_B)$$

$$\overrightarrow{r}_D - \overrightarrow{r}_A = \lambda \overrightarrow{r}_D - \lambda \overrightarrow{r}_B$$

$$\overrightarrow{r}_D - \lambda \overrightarrow{r}_D = \overrightarrow{r}_A - \lambda \overrightarrow{r}_B$$

$$(1 - \lambda) \overrightarrow{r}_D = \overrightarrow{r}_A - \lambda \overrightarrow{r}_B$$



$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

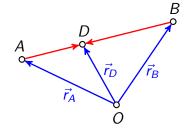
$$\overrightarrow{r}_D - \overrightarrow{r}_A = \lambda (\overrightarrow{r}_D - \overrightarrow{r}_B)$$

$$\overrightarrow{r}_D - \overrightarrow{r}_A = \lambda \overrightarrow{r}_D - \lambda \overrightarrow{r}_B$$

$$\overrightarrow{r}_D - \lambda \overrightarrow{r}_D = \overrightarrow{r}_A - \lambda \overrightarrow{r}_B$$

$$(1 - \lambda)\overrightarrow{r}_D = \overrightarrow{r}_A - \lambda \overrightarrow{r}_B$$

$$\overrightarrow{r}_D = \overrightarrow{r}_A - \lambda \overrightarrow{r}_B$$



$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

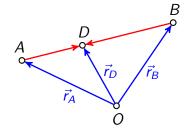
$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_D - \vec{r}_B)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_D - \lambda \vec{r}_B$$

$$\vec{r}_D - \lambda \vec{r}_D = \vec{r}_A - \lambda \vec{r}_B$$

$$(1 - \lambda)\vec{r}_D = \vec{r}_A - \lambda \vec{r}_B$$

$$\vec{r}_D = ----$$



$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

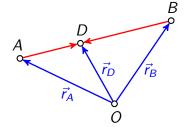
$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_D - \vec{r}_B)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_D - \lambda \vec{r}_B$$

$$\vec{r}_D - \lambda \vec{r}_D = \vec{r}_A - \lambda \vec{r}_B$$

$$(1 - \lambda)\vec{r}_D = \vec{r}_A - \lambda \vec{r}_B$$

$$\vec{r}_D = \frac{\vec{r}_A - \lambda \vec{r}_B}{\vec{r}_B}$$



$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

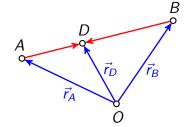
$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_D - \vec{r}_B)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_D - \lambda \vec{r}_B$$

$$\vec{r}_D - \lambda \vec{r}_D = \vec{r}_A - \lambda \vec{r}_B$$

$$(1 - \lambda)\vec{r}_D = \vec{r}_A - \lambda \vec{r}_B$$

$$\vec{r}_D = \frac{\vec{r}_A - \lambda \vec{r}_B}{1 - \lambda}$$



$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

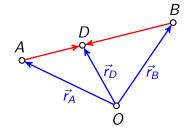
$$\overrightarrow{r}_D - \overrightarrow{r}_A = \lambda (\overrightarrow{r}_D - \overrightarrow{r}_B)$$

$$\overrightarrow{r}_D - \overrightarrow{r}_A = \lambda \overrightarrow{r}_D - \lambda \overrightarrow{r}_B$$

$$\overrightarrow{r}_D - \lambda \overrightarrow{r}_D = \overrightarrow{r}_A - \lambda \overrightarrow{r}_B$$

$$(1 - \lambda)\overrightarrow{r}_D = \overrightarrow{r}_A - \lambda \overrightarrow{r}_B$$

$$\overrightarrow{r}_D = \frac{\overrightarrow{r}_A - \lambda \overrightarrow{r}_B}{1 - \lambda}$$



$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

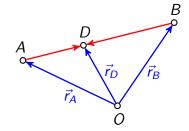
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_D} - \overrightarrow{r_B})$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_D} - \lambda \overrightarrow{r_B}$$

$$\overrightarrow{r_D} - \lambda \overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$(1 - \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$\lambda \neq 1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} - \lambda \overrightarrow{r_B}}{1 - \lambda}$$



$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

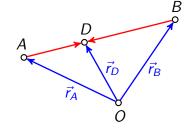
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_D} - \overrightarrow{r_B})$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_D} - \lambda \overrightarrow{r_B}$$

$$\overrightarrow{r_D} - \lambda \overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$(1 - \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$\lambda \neq 1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} - \lambda \overrightarrow{r_B}}{1 - \lambda}$$



$$A(x_A, y_A, z_A)$$

$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

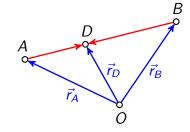
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_D} - \overrightarrow{r_B})$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_D} - \lambda \overrightarrow{r_B}$$

$$\overrightarrow{r_D} - \lambda \overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$(1 - \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$\lambda \neq 1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} - \lambda \overrightarrow{r_B}}{1 - \lambda}$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

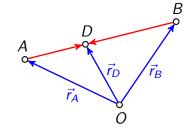
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_D} - \overrightarrow{r_B})$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_D} - \lambda \overrightarrow{r_B}$$

$$\overrightarrow{r_D} - \lambda \overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$(1 - \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$\lambda \neq 1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} - \lambda \overrightarrow{r_B}}{1 - \lambda}$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

D

$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_D} - \overrightarrow{r_B})$$

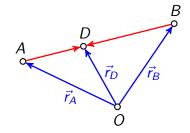
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_D} - \lambda \overrightarrow{r_B}$$

$$\overrightarrow{r_D} - \lambda \overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$(1 - \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$\lambda \neq 1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} - \lambda \overrightarrow{r_B}}{1 - \lambda}$$

$$D\left(\frac{x_A - \lambda x_B}{1 - \lambda},\right)$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_D} - \overrightarrow{r_B})$$

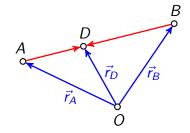
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_D} - \lambda \overrightarrow{r_B}$$

$$\overrightarrow{r_D} - \lambda \overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$(1 - \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$\lambda \neq 1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} - \lambda \overrightarrow{r_B}}{1 - \lambda}$$

$$D\bigg(\frac{x_A - \lambda x_B}{1 - \lambda}, \, \frac{y_A - \lambda y_B}{1 - \lambda}, \,$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_D} - \overrightarrow{r_B})$$

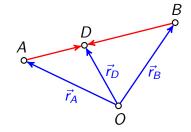
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_D} - \lambda \overrightarrow{r_B}$$

$$\overrightarrow{r_D} - \lambda \overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$(1 - \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$\lambda \neq 1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} - \lambda \overrightarrow{r_B}}{1 - \lambda}$$

$$D\left(\frac{x_A - \lambda x_B}{1 - \lambda}, \frac{y_A - \lambda y_B}{1 - \lambda}, \frac{z_A - \lambda z_B}{1 - \lambda}\right)$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_D} - \overrightarrow{r_B})$$

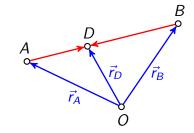
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_D} - \lambda \overrightarrow{r_B}$$

$$\overrightarrow{r_D} - \lambda \overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$(1 - \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$\lambda \neq 1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} - \lambda \overrightarrow{r_B}}{1 - \lambda}$$

$$D\left(\frac{x_A - \lambda x_B}{1 - \lambda}, \frac{y_A - \lambda y_B}{1 - \lambda}, \frac{z_A - \lambda z_B}{1 - \lambda}\right)$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$
polovište

$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_D} - \overrightarrow{r_B})$$

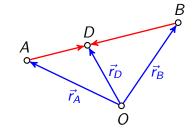
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_D} - \lambda \overrightarrow{r_B}$$

$$\overrightarrow{r_D} - \lambda \overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$(1 - \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$\lambda \neq 1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} - \lambda \overrightarrow{r_B}}{1 - \lambda}$$

$$D\left(\frac{x_A - \lambda x_B}{1 - \lambda}, \, \frac{y_A - \lambda y_B}{1 - \lambda}, \, \frac{z_A - \lambda z_B}{1 - \lambda}\right)$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

polovište $\lambda = -1$

$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_D} - \overrightarrow{r_B})$$

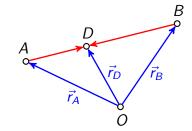
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_D} - \lambda \overrightarrow{r_B}$$

$$\overrightarrow{r_D} - \lambda \overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$(1 - \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$\lambda \neq 1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} - \lambda \overrightarrow{r_B}}{1 - \lambda}$$

$$D\left(\frac{x_A - \lambda x_B}{1 - \lambda}, \frac{y_A - \lambda y_B}{1 - \lambda}, \frac{z_A - \lambda z_B}{1 - \lambda}\right)$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

polovište $\lambda = -1$

$$P\left(\frac{x_A+x_B}{2}, \frac{y_A+y_B}{2}, \frac{z_A+z_B}{2}\right)$$

$$\overrightarrow{AD} = \lambda \overrightarrow{BD}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_D} - \overrightarrow{r_B})$$

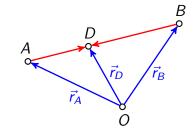
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_D} - \lambda \overrightarrow{r_B}$$

$$\overrightarrow{r_D} - \lambda \overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$(1 - \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} - \lambda \overrightarrow{r_B}$$

$$\lambda \neq 1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} - \lambda \overrightarrow{r_B}}{1 - \lambda}$$

$$D\left(\frac{x_A - \lambda x_B}{1 - \lambda}, \frac{y_A - \lambda y_B}{1 - \lambda}, \frac{z_A - \lambda z_B}{1 - \lambda}\right)$$

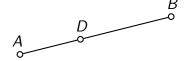


$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

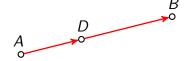
polovište $\lambda = -1$

$$P\left(\frac{x_A+x_B}{2}, \frac{y_A+y_B}{2}, \frac{z_A+z_B}{2}\right)$$

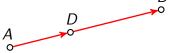
Beskonačno daleku točku možemo *uhvatiti* s homogenim koordinatama.



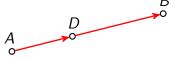




$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

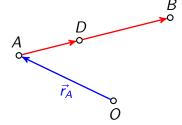


$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

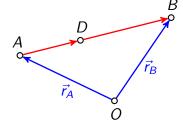




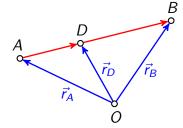
$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$



$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

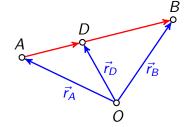


$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

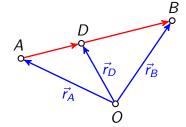


$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

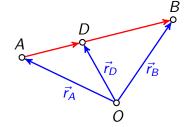
$$\overrightarrow{r_D} - \overrightarrow{r_A} =$$



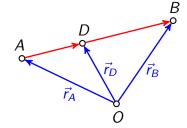
$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$
 $\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_D)$



$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$
 $\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_D)$
 $\vec{r}_D - \vec{r}_A =$



$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$
 $\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_D)$
 $\vec{r}_D - \vec{r}_A = \lambda \vec{r}_B - \lambda \vec{r}_D$

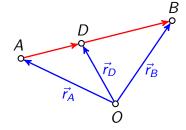


$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

$$\overrightarrow{r}_D - \overrightarrow{r}_A = \lambda (\overrightarrow{r}_B - \overrightarrow{r}_D)$$

$$\overrightarrow{r}_D - \overrightarrow{r}_A = \lambda \overrightarrow{r}_B - \lambda \overrightarrow{r}_D$$

$$\overrightarrow{r}_D + \lambda \overrightarrow{r}_D =$$

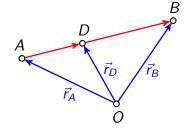


$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

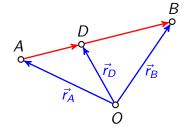
$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_D)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_B - \lambda \vec{r}_D$$

$$\vec{r}_D + \lambda \vec{r}_D = \vec{r}_A + \lambda \vec{r}_B$$



$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$
 $\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_D)$
 $\vec{r}_D - \vec{r}_A = \lambda \vec{r}_B - \lambda \vec{r}_D$
 $\vec{r}_D + \lambda \vec{r}_D = \vec{r}_A + \lambda \vec{r}_B$
 $(1 + \lambda)\vec{r}_D =$



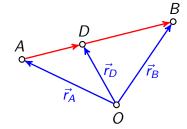
$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_D)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_B - \lambda \vec{r}_D$$

$$\vec{r}_D + \lambda \vec{r}_D = \vec{r}_A + \lambda \vec{r}_B$$

$$(1 + \lambda)\vec{r}_D = \vec{r}_A + \lambda \vec{r}_B$$



$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

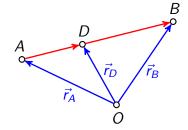
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_D})$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_D}$$

$$\overrightarrow{r_D} + \lambda \overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$(1 + \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$\overrightarrow{r_D} =$$



$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

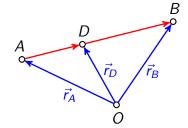
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$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_B - \lambda \vec{r}_D$$

$$\vec{r}_D + \lambda \vec{r}_D = \vec{r}_A + \lambda \vec{r}_B$$

$$(1 + \lambda)\vec{r}_D = \vec{r}_A + \lambda \vec{r}_B$$

$$\vec{r}_D = ----$$



$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

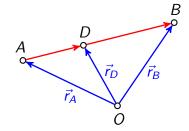
$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_D)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_B - \lambda \vec{r}_D$$

$$\vec{r}_D + \lambda \vec{r}_D = \vec{r}_A + \lambda \vec{r}_B$$

$$(1 + \lambda)\vec{r}_D = \vec{r}_A + \lambda \vec{r}_B$$

$$\vec{r}_D = \frac{\vec{r}_A + \lambda \vec{r}_B}{\vec{r}_B}$$



$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

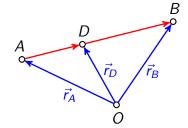
$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_D)$$

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$$\vec{r}_D + \lambda \vec{r}_D = \vec{r}_A + \lambda \vec{r}_B$$

$$(1 + \lambda)\vec{r}_D = \vec{r}_A + \lambda \vec{r}_B$$

$$\vec{r}_D = \frac{\vec{r}_A + \lambda \vec{r}_B}{1 + \lambda}$$



$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

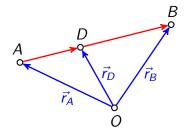
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_D})$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_D}$$

$$\overrightarrow{r_D} + \lambda \overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$(1 + \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$\overrightarrow{r_D} = \frac{\overrightarrow{r_A} + \lambda \overrightarrow{r_B}}{1 + \lambda}$$



$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

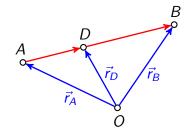
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_D})$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_D}$$

$$\overrightarrow{r_D} + \lambda \overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$(1 + \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$\lambda \neq -1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} + \lambda \overrightarrow{r_B}}{1 + \lambda}$$



$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

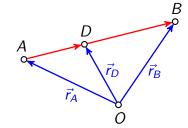
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_D})$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_D}$$

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$$\lambda \neq -1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} + \lambda \overrightarrow{r_B}}{1 + \lambda}$$



$$A(x_A, y_A, z_A)$$

$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

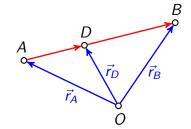
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_D})$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_D}$$

$$\overrightarrow{r_D} + \lambda \overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$(1 + \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$\lambda \neq -1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} + \lambda \overrightarrow{r_B}}{1 + \lambda}$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

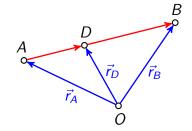
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_D})$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_D}$$

$$\overrightarrow{r_D} + \lambda \overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$(1 + \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$\lambda \neq -1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} + \lambda \overrightarrow{r_B}}{1 + \lambda}$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_D})$$

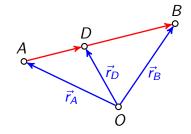
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_D}$$

$$\overrightarrow{r_D} + \lambda \overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$(1 + \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$\lambda \neq -1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} + \lambda \overrightarrow{r_B}}{1 + \lambda}$$

$$D\bigg(\frac{x_A + \lambda x_B}{1 + \lambda},$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_D})$$

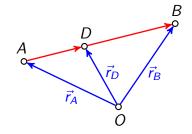
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_D}$$

$$\overrightarrow{r_D} + \lambda \overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$(1 + \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$\lambda \neq -1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} + \lambda \overrightarrow{r_B}}{1 + \lambda}$$

$$D\bigg(\frac{x_A + \lambda x_B}{1 + \lambda}, \, \frac{y_A + \lambda y_B}{1 + \lambda}, \,$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_D})$$

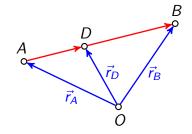
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_D}$$

$$\overrightarrow{r_D} + \lambda \overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$(1 + \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$\lambda \neq -1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} + \lambda \overrightarrow{r_B}}{1 + \lambda}$$

$$D\left(\frac{x_A + \lambda x_B}{1 + \lambda}, \frac{y_A + \lambda y_B}{1 + \lambda}, \frac{z_A + \lambda z_B}{1 + \lambda}\right)$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_D})$$

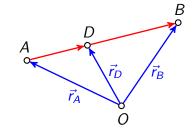
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_D}$$

$$\overrightarrow{r_D} + \lambda \overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$(1 + \lambda) \overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$\lambda \neq -1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} + \lambda \overrightarrow{r_B}}{1 + \lambda}$$

$$D\left(\frac{x_A + \lambda x_B}{1 + \lambda}, \, \frac{y_A + \lambda y_B}{1 + \lambda}, \, \frac{z_A + \lambda z_B}{1 + \lambda}\right)$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

polovište

$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

$$\overrightarrow{r}_D - \overrightarrow{r}_A = \lambda (\overrightarrow{r}_B - \overrightarrow{r}_D)$$

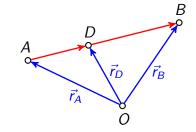
$$\overrightarrow{r}_D - \overrightarrow{r}_A = \lambda \overrightarrow{r}_B - \lambda \overrightarrow{r}_D$$

$$\overrightarrow{r}_D + \lambda \overrightarrow{r}_D = \overrightarrow{r}_A + \lambda \overrightarrow{r}_B$$

$$(1 + \lambda)\overrightarrow{r}_D = \overrightarrow{r}_A + \lambda \overrightarrow{r}_B$$

$$\lambda \neq -1 \qquad \overrightarrow{r}_D = \frac{\overrightarrow{r}_A + \lambda \overrightarrow{r}_B}{1 + \lambda}$$

$$D\!\left(\frac{x_A + \lambda x_B}{1 + \lambda}, \, \frac{y_A + \lambda y_B}{1 + \lambda}, \, \frac{z_A + \lambda z_B}{1 + \lambda}\right)$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

polovište $\lambda = 1$

$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_D})$$

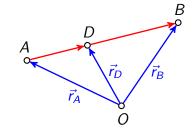
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_D}$$

$$\overrightarrow{r_D} + \lambda \overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$(1 + \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$\lambda \neq -1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} + \lambda \overrightarrow{r_B}}{1 + \lambda}$$

$$D\left(\frac{x_A + \lambda x_B}{1 + \lambda}, \frac{y_A + \lambda y_B}{1 + \lambda}, \frac{z_A + \lambda z_B}{1 + \lambda}\right)$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

polovište $\lambda = 1$

$$P\left(\frac{x_A+x_B}{2}, \frac{y_A+y_B}{2}, \frac{z_A+z_B}{2}\right)$$

$$\overrightarrow{AD} = \lambda \overrightarrow{DB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_D})$$

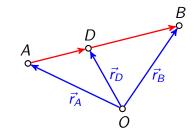
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_D}$$

$$\overrightarrow{r_D} + \lambda \overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$(1 + \lambda)\overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$\lambda \neq -1 \qquad \overrightarrow{r_D} = \frac{\overrightarrow{r_A} + \lambda \overrightarrow{r_B}}{1 + \lambda}$$

$$D\left(\frac{x_A + \lambda x_B}{1 + \lambda}, \frac{y_A + \lambda y_B}{1 + \lambda}, \frac{z_A + \lambda z_B}{1 + \lambda}\right)$$

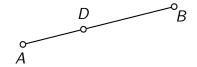


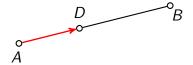
$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

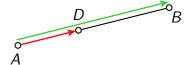
polovište $\lambda = 1$

$$P\left(\frac{x_A+x_B}{2}, \frac{y_A+y_B}{2}, \frac{z_A+z_B}{2}\right)$$

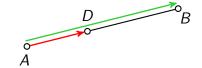
Beskonačno daleku točku možemo $\mathit{uhvatiti}$ s homogenim koordinatama.



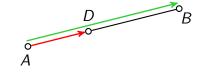




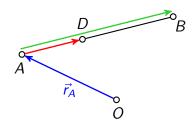
$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$



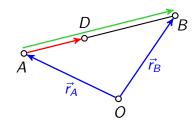
$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$



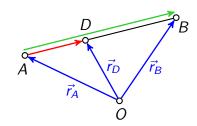
$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$



$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

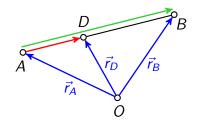


$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

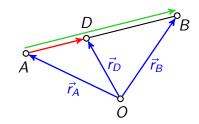


$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

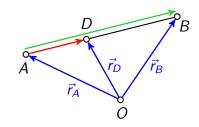
$$\overrightarrow{r_D} - \overrightarrow{r_A} =$$



$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$
 $\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_A)$



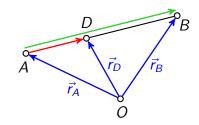
$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$
 $\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_A)$
 $\vec{r}_D - \vec{r}_A =$



$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_A)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_B - \lambda \vec{r}_A$$

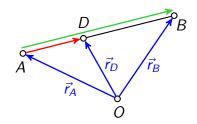


$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_A})$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_A}$$

$$\overrightarrow{r_D} =$$

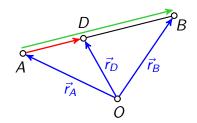


$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_A)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_B - \lambda \vec{r}_A$$

$$\vec{r}_D = \vec{r}_A + \lambda \vec{r}_B - \lambda \vec{r}_A$$



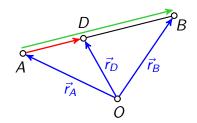
$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_A})$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_A}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_A}$$

$$\overrightarrow{r_D} =$$



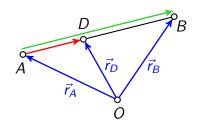
$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_A)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_B - \lambda \vec{r}_A$$

$$\vec{r}_D = \vec{r}_A + \lambda \vec{r}_B - \lambda \vec{r}_A$$

$$\vec{r}_D = (1 - \lambda)\vec{r}_A$$



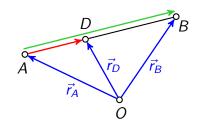
$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_A)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_B - \lambda \vec{r}_A$$

$$\vec{r}_D = \vec{r}_A + \lambda \vec{r}_B - \lambda \vec{r}_A$$

$$\vec{r}_D = (1 - \lambda)\vec{r}_A + \lambda \vec{r}_B$$



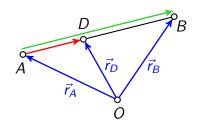
$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_A})$$

$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_A}$$

$$\overrightarrow{r_D} = \overrightarrow{r_A} + \lambda \overrightarrow{r_B} - \lambda \overrightarrow{r_A}$$

$$\overrightarrow{r_D} = (1 - \lambda) \overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$



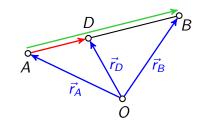
$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_A)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_B - \lambda \vec{r}_A$$

$$\vec{r}_D = \vec{r}_A + \lambda \vec{r}_B - \lambda \vec{r}_A$$

$$\vec{r}_D = (1 - \lambda)\vec{r}_A + \lambda \vec{r}_B$$



$$A(x_A, y_A, z_A)$$

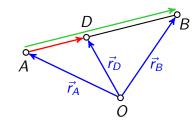
$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

$$\vec{r}_D - \vec{r}_A = \lambda (\vec{r}_B - \vec{r}_A)$$

$$\vec{r}_D - \vec{r}_A = \lambda \vec{r}_B - \lambda \vec{r}_A$$

$$\vec{r}_D = \vec{r}_A + \lambda \vec{r}_B - \lambda \vec{r}_A$$

$$\vec{r}_D = (1 - \lambda)\vec{r}_A + \lambda \vec{r}_B$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

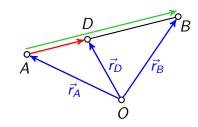
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$$\overrightarrow{r_D} = (1 - \lambda)\overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

D(

$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

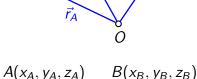
$$\overrightarrow{r_D} - \overrightarrow{r_A} = \lambda (\overrightarrow{r_B} - \overrightarrow{r_A})$$

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$$\overrightarrow{r_D} = (1 - \lambda)\overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$A(x_0, y_0)$$



$$D((1-\lambda)x_A+\lambda x_B,$$

$$\overrightarrow{AD} = \lambda \overrightarrow{AB}$$

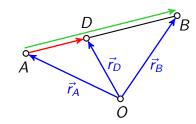
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$$\overrightarrow{r_D} = (1 - \lambda)\overrightarrow{r_A} + \lambda \overrightarrow{r_B}$$

$$D((1-\lambda)x_A+\lambda x_B, (1-\lambda)y_A+\lambda y_B,$$



$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

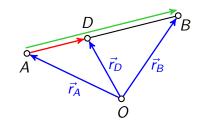
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$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

$$D((1-\lambda)x_A+\lambda x_B, (1-\lambda)y_A+\lambda y_B, (1-\lambda)z_A+\lambda z_B)$$

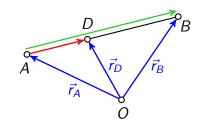
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$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

$$D((1-\lambda)x_A+\lambda x_B, (1-\lambda)y_A+\lambda y_B, (1-\lambda)z_A+\lambda z_B)$$

polovište

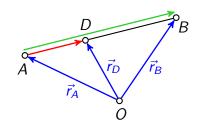
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$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

$$D((1-\lambda)x_A+\lambda x_B, (1-\lambda)y_A+\lambda y_B, (1-\lambda)z_A+\lambda z_B)$$

$$\text{polovište} \xrightarrow{} \lambda = \frac{1}{2}$$

$$\lambda = \frac{1}{2}$$

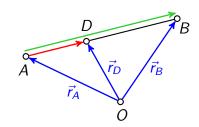
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$$A(x_A, y_A, z_A)$$
 $B(x_B, y_B, z_B)$

$$D((1-\lambda)x_A+\lambda x_B, (1-\lambda)y_A+\lambda y_B, (1-\lambda)z_A+\lambda z_B)$$

$$\lambda = \frac{1}{2}$$

polovište
$$\lambda = \frac{1}{2}$$
 $P\left(\frac{x_A + x_B}{2}, \frac{y_A + y_B}{2}, \frac{z_A + z_B}{2}\right)$

$$\vec{r}_D = \frac{1}{1 - \lambda} \vec{r}_A + \frac{-\lambda}{1 - \lambda} \vec{r}_B$$

$$\vec{r}_D = \frac{\vec{r}_A + \lambda \vec{r}_B}{1 + \lambda}$$

$$\vec{r}_D = \frac{1}{1 + \lambda} \vec{r}_A + \frac{\lambda}{1 + \lambda} \vec{r}_B$$



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$$\vec{r_D} = \frac{\vec{r_A} - \lambda \vec{r_B}}{1 - \lambda}$$

$$\lambda = 1 \qquad \lambda = 0 \qquad \lambda = -1 \qquad \lambda = \pm \infty \qquad \lambda = 1$$

$$\infty \qquad A \qquad P \qquad B \qquad \infty$$

$$\vec{r_D} = \frac{\vec{r_A} + \lambda \vec{r_B}}{1 + \lambda}$$

$$\lambda = -1 \qquad \lambda = 0 \qquad \lambda = 1 \qquad \lambda = \pm \infty \qquad \lambda = -1$$

$$\Delta = -1 \qquad \Delta = 0 \qquad \lambda = 1 \qquad \lambda = \pm \infty \qquad \lambda = -1$$

$$\Delta = -1 \qquad \Delta = 0 \qquad \lambda = 0 \qquad \lambda = 0$$

$$\vec{r_D} = (1 - \lambda)\vec{r_A} + \lambda \vec{r_B}$$

$$\lambda = -\infty \qquad \lambda = 0 \qquad \lambda = 0$$

$$\Delta = 0 \qquad \lambda = 1 \qquad \lambda = 1 \qquad \lambda = +\infty$$

$$\Delta = -\infty \qquad \Delta = 0 \qquad \Delta = 0 \qquad \Delta = 0$$

$$\Delta = 0 \qquad \Delta = 0 \qquad \Delta = 0 \qquad \Delta = 0$$