UNIVERZITET U SARAJEVU
ELEKTROTEHNIČKI FAKULTET U SARAJEVU

ODSJEK: Svi odsjeci **GODINA STUDIJA: PGS**

LINEARNA ALGEBRA I GEOMETRIJA

TUTORIJAL Br.7

Zadatak 1.

Da li vektori$\vec{a} = (1,2,1), \vec{b} = (3,-1,0)$ i $\vec{c} = (4,0,2)$ čine bazu vektorskog prostora? Ako čine izraziti vektor $\vec{d} = (1,-1,3)$ u tom prostoru.

Rješenje: DA! $\vec{d} = -\frac{8}{5}\vec{a} - \frac{11}{5}\vec{b} + \frac{23}{10}\vec{c}$.

Zadatak 2.

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

a) Odrediti λ tako da vektor $\vec{a}$ zaklapa jednake uglove s vektorima $\vec{b}$ i $\vec{c}$.
b) Naći zapreminu i jednu od visina paralelopipeda konstruiranog nad tim vektorima.

Rješenje:

a) $\lambda = \frac{1}{4}$.
b) $V = 9{,}5$; $H = 2{,}75$.

Zadatak 3.

Zadani su vrhovi $A(-1,-9,-7)$, $B(13,-3,-11)$ i $C(5,13,-5)$ paralelograma ABCD. Odrediti koordinate vrha D i izračunati površinu, obim, unutarnje uglove i visinu tog paralelograma.

Rješenje: $D(-9,7,1)$; $P_{\square} = 294{,}43$; $O = 69{,}24$; $\alpha = 82{,}26^0$.

Zadatak 4.

Odrediti zapreminu tetraedra SABC, površinu trougla ABC i odgovoriti na pitanje koje je orijentacije triedar vektora $(\vec{a}, \vec{b}, \vec{c})$. Razložiti vektor $\vec{a} \times \vec{b}$ na komponente u tom triedru. Poznato je $\vec{a} = \overrightarrow{SA} = (2,4,0), \vec{b} = \overrightarrow{SB} = (4,3,1)$ i $\vec{c} = \overrightarrow{SC} = (3,0,4)$.

Rješenje: $V = \frac{14}{3}$; Lijeva orjentacija; $P_{\square} = \sqrt{30}$.

Zadatak 5.

Naći koordinate tačke B kao drugog tjemena paralelograma ABCD, a potom ugao između dijagonala, dužine dijagonala, površinu i zapreminu piramide ABCDS, ako su dane tačke: $A(2,1,-1)$, $C(1,2,0)$, $D(-1,0,2)$ i $S(4,-3,-2)$.

Rješenje: $B(4,3,-3)$; $|\vec{d}_1| = \sqrt{3}$; $|\vec{d}_2| = \sqrt{59}$; $\alpha = 58{,}254^0$; $P = 4\sqrt{2}$; $V = \frac{4}{3}$.

Zadatak 6.

Zadana su redom tri uzastopna vrha paralelograma ABCD: $A(-3,2,\lambda)$, $B(3,-3,1)$ i $C(5,\lambda,2)$.

a) Odrediti četvrti vrh D.

b) Odrediti λ tako da je $\left|\overrightarrow{AD}\right| = \sqrt{14}$.

c) Za veću vrijednost λ , nađenu u tački b), naći linearnu zavisnost između vektora: $\overrightarrow{AD}$, $\overrightarrow{BC}$ i $\overrightarrow{AC}$. Razložiti vektor $\overrightarrow{AC}$ preko vektora $\overrightarrow{AD}$ i $\overrightarrow{BD}$.

Rješenje:

a) $D(-1,5+\lambda,1+\lambda)$.

b) $\lambda_1 = 0$; $\lambda_2 = -6$.

c) $\overrightarrow{AC} = 2\overrightarrow{AD} - \overrightarrow{BD}$.

T7 – Analitička geometrija u ravni

SUBJECT	TEACHER	GRADE	DATE
LAG	Asis. Kenan Turbić	1	December 23, 2013

OVERVIEW

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

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

$\vec{c} = (4,0,2)$

$\vec{d} = (1,-1,3)$

Vektori $\vec{a}, \vec{b}$ i $\vec{c}$ čine bazu vektorskog prostora ako su linearno nezavisni. Vektori su linearno nezavisni ako nisu komplanarni, a komplanarni su ako je $(\vec{a} \times \vec{b}) \circ \vec{c} = 0$

$$(\vec{a} \times \vec{b}) \circ \vec{c} = \begin{vmatrix} 1 & 2 & 1 \\ 3 & -1 & 0 \\ 4 & 0 & 2 \end{vmatrix} \begin{matrix} 1 & 2 \\ 3 & -1 \\ 4 & 0 \end{matrix} = -2 + 4 - 12 = -10 \neq 0 \Rightarrow$$ Vektori su

nekomplanarni, tj. linearno nezavisni i čine bazu vekt. prostora

$$\vec{d} = \alpha \vec{a} + \beta \vec{b} + \gamma \vec{c}$$

$$\alpha \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix} + \beta \begin{bmatrix} 3 \\ -1 \\ 0 \end{bmatrix} + \gamma \begin{bmatrix} 4 \\ 0 \\ 2 \end{bmatrix} = \begin{bmatrix} 1 \\ -1 \\ 3 \end{bmatrix}$$

$\alpha + 3\beta + 4\gamma = 1 \Rightarrow \alpha = \frac{-8}{5}$

$2\alpha - \beta = -1 \Rightarrow \beta = 2\alpha + 1 \Rightarrow \beta = -\frac{11}{5}$

$\alpha + 2\gamma = 3 \Rightarrow \gamma = \frac{1}{2}(3 - \alpha) \Rightarrow \gamma = \frac{23}{10}$

$$\boxed{\vec{d} = \frac{-8}{5}\vec{a} - \frac{11}{5}\vec{b} + \frac{23}{10}\vec{c}}$$

2)

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

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

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

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a) $\lambda = ?$ $\measuredangle \vec{a},\vec{b} = \measuredangle \vec{a},\vec{c} = \alpha$

b) $V, h = ?$

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a)

$$\vec{a}\circ\vec{b} = |\vec{a}||\vec{b}|\cos\alpha \Rightarrow \cos\alpha = \frac{\vec{a}\circ\vec{b}}{|\vec{a}||\vec{b}|}$$

$$\vec{a}\circ\vec{c} = |\vec{a}||\vec{c}|\cos\theta \Rightarrow \cos\theta = \frac{\vec{a}\circ\vec{c}}{|\vec{a}||\vec{c}|}$$

$$\cos\alpha = \cos\theta$$

$$\frac{\vec{a}\circ\vec{b}}{|\vec{a}||\vec{b}|} = \frac{\vec{a}\circ\vec{c}}{|\vec{a}||\vec{c}|} \Rightarrow \frac{\vec{a}\circ\vec{b}}{|\vec{b}|} = \frac{\vec{a}\circ\vec{c}}{|\vec{c}|}$$

$|\vec{b}| = \sqrt{1+9} = \sqrt{10}$; $|\vec{c}| = \sqrt{25+1+64} = \sqrt{90} = 3\sqrt{10}$

$\vec{a}\circ\vec{b} = -2\lambda + 3$

$\vec{a}\circ\vec{c} = 10\lambda - 1 + 8 - 8\lambda \Rightarrow \vec{a}\circ\vec{c} = 2\lambda + 7$

$$\frac{\vec{a}\circ\vec{b}}{|\vec{b}|} = \frac{\vec{a}\circ\vec{c}}{|\vec{c}|} \Rightarrow \frac{-2\lambda+3}{\sqrt{10}} = \frac{2\lambda+7}{3\sqrt{10}}$$

$$-6\lambda + 9 = 2\lambda + 7$$

$$8\lambda = 2 \Rightarrow \boxed{\lambda = \frac{1}{4}}$$

b)

$$V = (\vec{a} \times \vec{b}) \circ \vec{c}$$

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

$$= \frac{1}{4} \cdot (48 + 3 - 45 + 32) = \frac{1}{4_2} \cdot 38^{19} = \frac{19}{2} \Rightarrow \boxed{V = 3,45}$$

$$V = B \cdot h \Rightarrow h = \frac{V}{B} \quad ; \quad B = |\vec{a} \times \vec{b}|$$

$$(\vec{a} \times \vec{b}) = \frac{1}{4} \begin{vmatrix} i & j & k \\ 2 & 4 & 3 \\ -1 & 3 & 0 \end{vmatrix} = \frac{1}{4} \left\{ i \begin{vmatrix} 4 & 3 \\ 3 & 0 \end{vmatrix} - j \begin{vmatrix} 2 & 3 \\ -1 & 0 \end{vmatrix} + k \begin{vmatrix} 2 & 4 \\ -1 & 3 \end{vmatrix} \right\} =$$

$$= \frac{1}{4} (-9\vec{i} - 3\vec{j} + 10\vec{k})$$

$$B = |\vec{a} \times \vec{b}| = \frac{1}{4} \sqrt{81 + 9 + 100} = \frac{1}{4} \sqrt{190} = 3,45$$

$$h = \frac{\frac{19}{2}}{3,45} \Rightarrow \boxed{h = 2,75}$$

3.)

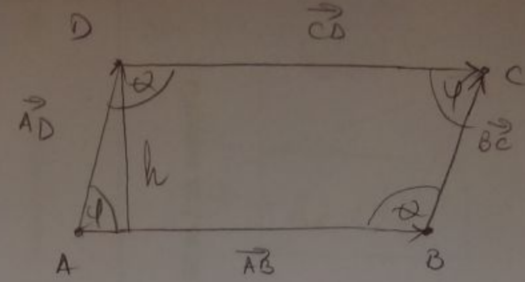
$A(-1,-9,-7)$

$B(13,-3,-11)$

$C(5,13,-5)$

$D(x_D, y_D, z_D) = ?$

$P, O, \varphi, \alpha, h = ?$



$\vec{AB} = \vec{CD}$

$\vec{AB} = (x_B - x_A,\ y_B - y_A,\ z_B - z_A) = (14, 6, -4)$

$\vec{CD} = (x_C - x_D,\ y_C - y_D,\ z_C - z_D) = (5 - x_D, 13 - y_D, -5 - z_D)$

$5 - x_D = 14 \Rightarrow x_D = -9$

$13 - y_D = 6 \Rightarrow y_D = 7$

$-5 - z_D = -4 \Rightarrow z_D = -1$

$\Rightarrow \boxed{D(-9, 7, -1)}$

$P = |\vec{AB} \times \vec{BC}|$

$BC = (x_C - x_B,\ y_C - y_B,\ z_C - z_B) = (-8, 16, 6)$

$\vec{AB} \times \vec{BC} = \begin{vmatrix} i & j & k \\ 14 & 6 & -4 \\ -8 & 16 & 8 \end{vmatrix} = \vec{i} \begin{vmatrix} 6 & -4 \\ 16 & 8 \end{vmatrix} - \vec{j} \begin{vmatrix} 14 & -4 \\ -10 & 8 \end{vmatrix} + \vec{k} \begin{vmatrix} 14 & 6 \\ -10 & 16 \end{vmatrix} =$

$= 100\vec{i} - 52\vec{j} - 272\vec{k}$

$|\vec{AB} \times \vec{BC}| = \sqrt{86688} = 294,43 \Rightarrow \boxed{P = 294,43}$

$O = 2|\vec{AB}| + 2|\vec{BC}| = 31,5 + 37,74 = 69,24$

$\boxed{O = 69,24}$

$|\vec{AB}| = \sqrt{248} = 15,75$; $|\vec{BC}| = \sqrt{356} = 18,87$

$$\vec{AB} \times \vec{BC} = |\vec{AB}|\,|\vec{BC}|\,\sin\theta \Rightarrow \sin\theta = \frac{\vec{AB} \times \vec{BC}}{|\vec{AB}|\,|\vec{BC}|}$$

$$\sin\theta = \frac{294,43}{297,2} = 0,99 \Rightarrow \boxed{\theta = 82,171}$$

$$\theta + \varphi = 180 \Rightarrow \boxed{\varphi = 97,83}$$

$$P = |\vec{AB}| \cdot h \Rightarrow h = \frac{P}{|\vec{AB}|}$$

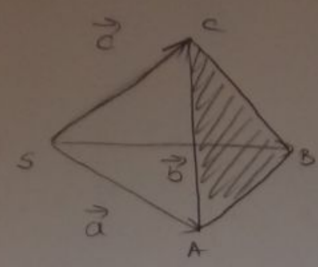
$$h = \frac{294,43}{15,75} \Rightarrow \boxed{h = 18,69}$$

4.)

$\vec{a} = \vec{SA} = (2,4,0)$

$\vec{b} = \vec{SB} = (4,3,1)$

$\vec{c} = \vec{SC} = (3,0,4)$



$V_{SABC},\ P_{ABC} = ?$

$$V_{SABC} = \frac{1}{6} \cdot V_p = \frac{1}{6} \left| (\vec{a} \times \vec{b}) \cdot \vec{c} \right|$$

$$(\vec{a} \times \vec{b}) \cdot \vec{c} = \begin{vmatrix} 2 & 4 & 0 \\ 4 & 3 & 1 \\ 3 & 0 & 4 \end{vmatrix} \begin{matrix} 2 & 4 \\ 4 & 3 \\ 3 & 0 \end{matrix} = 24 + 12 - 64 = -28 < 0 \Rightarrow$$

Lijeva orijentacija!

$$V_{SABC} = \frac{1}{6} \cdot |-28| = 4{,}67 \Rightarrow \boxed{V_{SABC} = 4{,}67}$$

$$P_{ABC} = \frac{1}{2} \left| \vec{AB} \times \vec{BC} \right|$$

$\vec{AB} = \vec{b} - \vec{a} \Rightarrow \vec{AB} = (2,-1,1)$

$\vec{BC} = \vec{c} - \vec{b} \Rightarrow \vec{BC} = (-1,-3,3)$

$$\vec{AB} \times \vec{BC} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 2 & -1 & 1 \\ -1 & -3 & 3 \end{vmatrix} = \vec{i} \begin{vmatrix} -1 & 1 \\ -3 & 3 \end{vmatrix} - \vec{j} \begin{vmatrix} 2 & 1 \\ -1 & 3 \end{vmatrix} + \vec{k} \begin{vmatrix} 2 & -1 \\ -1 & -3 \end{vmatrix} =$$

$$= -7\vec{j} - 7\vec{k}$$

$$P_{ABC} = \frac{1}{2} \cdot \sqrt{7^2 + 7^2} = \frac{1}{2} \cdot 9{,}90 = 4{,}95 \Rightarrow \boxed{P_{ABC} = 4{,}95}$$

$$\vec{a} \times \vec{b} = \alpha \vec{a} + \beta \vec{b} + \gamma \vec{c}$$

$$\vec{a} \times \vec{b} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 2 & 4 & 0 \\ 4 & 3 & 1 \end{vmatrix} = \vec{i} \begin{vmatrix} 4 & 0 \\ 3 & 1 \end{vmatrix} - \vec{j} \begin{vmatrix} 2 & 0 \\ 4 & 1 \end{vmatrix} + \vec{k} \begin{vmatrix} 2 & 4 \\ 4 & 3 \end{vmatrix} =$$

$$= 4\vec{i} - 2\vec{j} - 10\vec{k}$$

$$\alpha \begin{bmatrix} 2 \\ 4 \\ 0 \end{bmatrix} + \beta \begin{bmatrix} 4 \\ 3 \\ 1 \end{bmatrix} + \gamma \begin{bmatrix} 3 \\ 0 \\ 4 \end{bmatrix} = \begin{bmatrix} 4 \\ -2 \\ -10 \end{bmatrix}$$

$$2\alpha + 4\beta + 3\gamma = 4$$

$$4\alpha + 3\beta = -2 \quad \Rightarrow \quad \alpha = -\frac{1}{4}(3\beta + 2)$$

$$\beta + 4\gamma = -10 \quad \Rightarrow \quad \gamma = -\frac{1}{4}(\beta + 10)$$

$$\beta = \frac{50}{7} \quad ; \quad \alpha = \frac{-41}{7} \quad ; \quad \gamma = -\frac{30}{7}$$

$$\boxed{\vec{a} \times \vec{b} = -\frac{41}{7}\vec{a} + \frac{50}{7}\vec{b} - \frac{30}{7}\vec{c}}$$

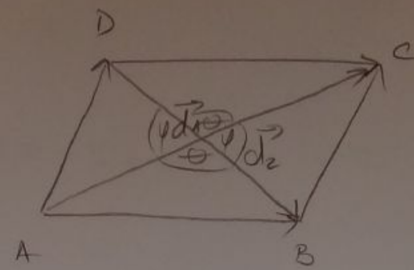
5)

$A(2,1,-1)$

$C(1,2,0)$

$D(-1,0,2)$

$S(4,-3,-2)$



$B(x_B, y_B, z_B) = ?$

$|\vec{d_1}| = ?$

$|\vec{d_2}| = ?$ $\quad \theta, \varphi = ?$

$P_{ABCD}, V_{SABCD} = ?$

$\vec{AB} = \vec{DC}$

$\vec{DC} = (x_C - x_D, y_C - y_D, z_C - z_D) = (2, 2, -2)$

$\vec{AB} = (x_B - x_A, y_B - y_A, z_B - z_A) = (x_B - 2, y_B - 1, z_B + 1)$

$x_B - 2 = 2 \Rightarrow x_B = 4$

$y_B - 1 = 2 \Rightarrow y_B = 3$

$z_B + 1 = -2 \Rightarrow z_B = -3$

$\boxed{B(4, 3, -3)} \Rightarrow \vec{AB} = (2, 2, -2)$

$\vec{d_1} = \vec{AB} + \vec{AD}$; $\vec{AD} = (x_D - x_A, y_D - y_A, z_D - z_A) = (-3, -1, 3)$

$\vec{d_1} = (2, 2, -2) + (-3, -1, 3) = (-1, 1, 1)$

$|\vec{d_1}| = \sqrt{1^2 + 1^2 + 1^2} \Rightarrow \boxed{|\vec{d_1}| = \sqrt{3}}$

$\vec{d_2} = \vec{AB} - \vec{AD} = (2, 2, -2) - (-3, -1, 3) = (5, 3, -5)$

$|\vec{d_2}| = \sqrt{5^2 + 3^2 + 5^2} \Rightarrow \boxed{|\vec{d_2}| = \sqrt{59}}$

$$\vec{d_1}\circ\vec{d_2} = |\vec{d_1}||\vec{d_2}|\cdot\cos\theta \Rightarrow \cos\theta = \frac{\vec{d_1}\circ\vec{d_2}}{|\vec{d_1}||\vec{d_2}|}$$

$$\vec{d_1}\circ\vec{d_2} = (-1,1,1)(5,3,-5) = -5+3-5 = -7$$

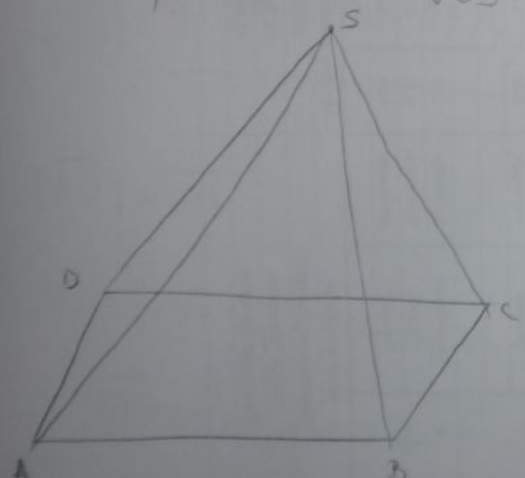
$$\cos\theta = \frac{-7}{\sqrt{3\cdot 59}} = \frac{-7}{\sqrt{177}} = -0,526$$

$$\boxed{\theta = 121,74^\circ}$$

$$\varphi + \theta = 180 \Rightarrow \varphi = 180 - \theta \Rightarrow \boxed{\varphi = 58,26^\circ}$$

$$P_{ABCD} = |\vec{AB}\times\vec{AD}| = \left|\begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 2 & 2 & -2 \\ -3 & -1 & 3 \end{vmatrix}\right| = \left|\vec{i}\begin{vmatrix} 2 & -2 \\ -1 & 3 \end{vmatrix} - \vec{j}\begin{vmatrix} 2 & -2 \\ -3 & 3 \end{vmatrix} + \vec{k}\begin{vmatrix} 2 & 2 \\ -3 & -1 \end{vmatrix}\right| =$$

$$= |4\vec{i} + 4\vec{k}| = \sqrt{4^2+4^2} = \sqrt{39} \Rightarrow \boxed{P_{ABCD} = 4\sqrt{2}}$$



$$V_{SABCD} = \frac{1}{3} V_p$$

$$V_p = |(\vec{AB}\times\vec{AD})\circ\vec{AS}|$$

$$\vec{AS} = (x_S - x_A, y_S - y_A, z_S - z_A) = (2,-4,-1)$$

$$(\vec{AB}\times\vec{AD})\circ\vec{AS} = \begin{vmatrix} 2 & 2 & -2 \\ -3 & -1 & 3 \\ 2 & -4 & -1 \end{vmatrix}\begin{matrix} 2 & 2 \\ -3 & -1 \\ 2 & -4 \end{matrix} = 2+12-\cancel{24}-4+\cancel{24}-6 = 4$$

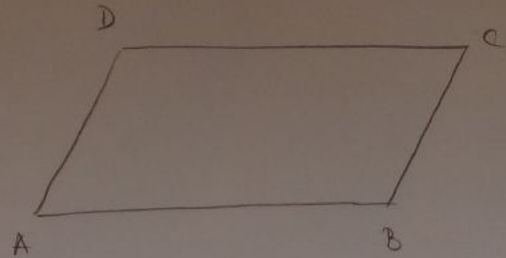
$$V_{SABCD} = \frac{1}{3}\cdot 4 = \frac{4}{3} \Rightarrow \boxed{V_{SABCD} = 1,333}$$

6)

$A(-3, 2, \lambda)$

$B(3, -3, 1)$

$C(5, \lambda, 2)$



a) $D(x_D, y_D, z_D) = ?$

b) $\lambda = ?$ $|\overrightarrow{AD}| = \sqrt{14}$

c) $\overrightarrow{AD}, \overrightarrow{BC}, \overrightarrow{AC}$

$\overrightarrow{AC}$ preko $\overrightarrow{AD}$ i $\overrightarrow{BD}$

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

$\overrightarrow{AB} = (x_B - x_A, y_B - y_A, y_B - y_A) = (6, -5, 1-\lambda)$

$\overrightarrow{DC} = (x_C - x_D, y_C - y_D, z_C - z_D) = (5 - x_D, \lambda - y_D, 2 - z_D)$

$5 - x_D = 6 \Rightarrow x_D = -1$

$\lambda - y_D = -5 \Rightarrow y_D = 5 + \lambda$

$2 - z_D = 1 - \lambda \Rightarrow z_D = 1 + \lambda$

$$D(-1, 5+\lambda, 1+\lambda)$$

b) $|\overrightarrow{AD}| = \sqrt{14}$

$\overrightarrow{AD} = (-3-1, 2-5-\lambda, \lambda - 1 - \lambda) = (-4, -3-\lambda, -1)$

$|\overrightarrow{AD}| = \sqrt{4^2 + (-3-\lambda)^2 + 1^2}$

$\sqrt{14} = \sqrt{5 + (-3-\lambda)^2} \quad /^2$

$14 - 5 = (-3-\lambda)^2$

$14 - 5 = 9 + 2 \cdot (-3)(-\lambda) + \lambda^2$

$9 = 9 + 6\lambda + \lambda^2$

$6\lambda + \lambda^2 = 0$

$\lambda(6 + \lambda) = 0$

$$\lambda_1 = 0$$

$$\lambda_2 = -6$$

c) Veća vrijednost ⇒ $\lambda = 0$

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

$\vec{AB} = (-4, -3, -1)$
$\vec{BC} = (2, 3, 1)$
$\vec{AC} = (8, -2, 2)$

$$\begin{bmatrix} -4 & -3 & -1 \\ 2 & 3 & 1 \\ 8 & -2 & 2 \end{bmatrix} \begin{bmatrix} \alpha \\ \beta \\ \gamma \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$-4\alpha - 3\beta - \gamma = 0$
$2\alpha + 3\beta + \gamma = 0$
$8\alpha - 2\beta + 2\gamma = 0 \Rightarrow 2\gamma = 2\beta - 8\alpha \Rightarrow \gamma = \frac{\beta - 8\alpha}{2} \Rightarrow \gamma = 0$

$2\alpha + 3\beta + \frac{\beta - 8\alpha}{2} = 0 \;/2$

$4\alpha + 6\beta + \beta - 8\alpha = 0$

$-4\alpha + 7\beta = 0 \Rightarrow \beta = \frac{4\alpha}{7} \Rightarrow \beta = 0$

$(1) \Rightarrow -4\alpha - 3 \cdot \frac{4\alpha}{7} - \frac{\beta - 8\alpha}{2} = 0 \;/14$

$-56\alpha - 24\alpha - 7\beta + 56\alpha = 0$

$-24\alpha - 7 \cdot \frac{4\alpha}{7} = 0 \Rightarrow -24\alpha - 4\alpha = 0 \Rightarrow \alpha = 0$

Vektori $\overrightarrow{AD}, \overrightarrow{BC}, \overrightarrow{AC}$ su linearno nezavisni!

$\overrightarrow{AC}$ preko $\overrightarrow{AD}$ i $\overrightarrow{BD}$

$$\overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{AD}$$

$$\overrightarrow{BD} = -(\overrightarrow{AB} - \overrightarrow{AD}) \Rightarrow \overrightarrow{AB} = -\overrightarrow{BD} + \overrightarrow{AD}$$

$$\overrightarrow{AC} = -\overrightarrow{BD} + \overrightarrow{AD} + \overrightarrow{AD}$$

$$\boxed{\overrightarrow{AC} = 2\overrightarrow{AD} - \overrightarrow{BD}}$$

by Ajla Alić