

pr: $A[1;2;2], B[3;2;5], \vec{AB}=?$

$$\vec{u} = B - A = (3-1; 2-2; 5-2) = (2; 0; 3)$$

pr: $A[3;5], B[2;0]; C[1;2], D[-1;2]$

$AB; CD$

$$\vec{u} = (2-3; 0-5) = (-1; -5)$$

$$\vec{v} = (-1-1; 2-2) = (-2; 0)$$

pr: $\vec{u} = (3;5), \vec{v} = \vec{AB}; A[-1;2]; B[3;-1], \vec{u} + \vec{v}=?$

$$\vec{v} = (3+1; -1-2) = (4; -3)$$

$$\vec{u} + \vec{v} = (4+3; -3+5) = (7; 2)$$

pr: $\vec{u} = (3;7;5), \vec{v} = (2;-2;1), \vec{u} \pm \vec{v}=?$

$$\vec{u} + \vec{v} = (2+3; -2+7; 1+5) = (5; 7; 6)$$

$$\vec{u} - \vec{v} = (3-2; 7-(-2); 5-1) = (1; 9; 4)$$

pr: $\vec{u} = \vec{v} + 2\vec{w}; \vec{v} = (2;1;-3), \vec{w} = (2;3;1)$

$$\vec{u} = (2+2 \cdot 2; 1+2 \cdot 3; -3+2 \cdot 1) = (6; 7; -1)$$

pr: Je $\vec{w} = (5;4)$ lin. kombinací vektorů $\vec{u} = (1;2)$ a $\vec{v} = (2;1)$?

$$\vec{w} = a \cdot \vec{u} + b \cdot \vec{v}$$

$$(5;4) = a(1;2) + b(2;1)$$

$$\Rightarrow \vec{w} = \vec{u} + 2\vec{v}$$

$$\Rightarrow \text{ano, je.}$$

$$5 = 1a + 2b$$

$$4 = 2a + 1b$$

$$a = 5 - 2b$$

$$4 = 2(5 - 2b) + b$$

$$4 = 10 - 4b + b$$

$$-6 = -3b$$

$$b = 2$$

$$a = 1$$

pi: Je $\vec{w} = (4; 5)$ lin. komb. $\vec{u} = (2; -1)$ a $\vec{v} = (-4; 2)$?

$$\vec{w} = a \cdot \vec{u} + b \cdot \vec{v}$$

$$(4; 5) = a \cdot (2; -1) + b \cdot (-4; 2) \quad \begin{matrix} 4 = -10 \\ \text{nepl.} \end{matrix}$$

$$4 = 2a - 4b$$

$$5 = -a + 2b$$

\Rightarrow Nejsou.

$$a = 2b - 5$$

$$4 = 2(2b - 5) - 4b$$

$$4 = 4b - 10 - 4b$$

pi: Je $\vec{u} = (7; 11; 4)$ lin. komb. $\vec{v} = (2; 1; -1)$ a $\vec{w} = (1; 3; 2)$?

$$7 = a \cdot 2 + b \cdot 1 \quad a = 11 - 3 \cdot 3$$

$$11 = a \cdot 1 + b \cdot 3 \quad a = 2$$

$$4 = a \cdot (-1) + b \cdot 2 \quad \vec{u} = 2\vec{v} + 3\vec{w}$$

$$a = 11 - 3b$$

\Rightarrow Je.

$$7 = 22 - 6b + b$$

$$-15 = -5b$$

$$b = 3$$

pi: $\vec{u} = (3; 4); |\vec{u}| = ?$

$$|\vec{u}| = \sqrt{3^2 + 4^2} = 5$$

pi: $\vec{u} = (-3; 0); |\vec{u}| = \sqrt{9} = 3$

pi: Skalární součin $\vec{u} = (1; -2)$ a $\vec{v} = (2; -3) = ?$

$$\vec{u} \cdot \vec{v} = 1 \cdot 2 + (-2)(-3) = 2 + 6 = 8$$

pi: $\vec{u} \cdot \vec{v} = ?; \vec{u} = (0; -5; 2); \vec{v} = (3; -8; -3)$

$$\vec{u} \cdot \vec{v} = 0 + 40 + 6 = 46$$

pr: vektorový součin $\vec{u} = (2; 3; 1) \propto \vec{v} = (1; 2; 1)$

$$\vec{u} \times \vec{v} = (3 \cdot 1 - 1 \cdot 2; 1 \cdot 1 - 1 \cdot 2; 2 \cdot 2 - 3 \cdot 1) = (1; -1; 1)$$

pr: $\vec{u} = (-6; 1; -1); \vec{v} = (4; -4; 0); \vec{u} \times \vec{v} = ?$

$$\vec{u} \times \vec{v} = (1 \cdot 0 - (-1) \cdot (-4); -1 \cdot 4 - (-6) \cdot 0; -6 \cdot (-4) - 1 \cdot 4) = (-4; -4; 20)$$

pr: směr. součin $(\vec{u} \times \vec{v}) \cdot \vec{w}; \vec{u} = (5; 1; 0); \vec{v} = (1; 4; 1); \vec{w} = (1; 0; 3)$

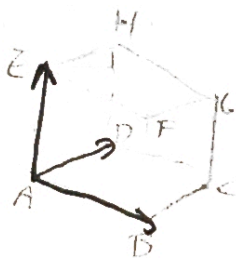
Smíšený součin - abs. hodn. smíš. souz. = objem rovnoběžnostěn určených vektory.



$$\vec{u} \times \vec{v} = (1 \cdot 1 - 0 \cdot 0; 0 \cdot 5 - 1 \cdot 1; 5 \cdot 4 - 1 \cdot 1) = (1; -1; 19)$$

$$\vec{w} \cdot (\vec{u} \times \vec{v}) = (1; 0; 3) \cdot (1; -1; 19) = 1 - 3 = -2$$

pr: objem rovnoběžnostěn ABCDEFGH; $A[1; 0; 0], B[6; 0; 0], C[6; -4; 0], D[1; -4; 0], E[1; 0; 5], F[6; 0; 5], G[6; -4; 5], H[1; -4; 5]$



$$\vec{u} = B - A = (5; 0; 0)$$

$$\vec{v} = D - A = (0; -4; 0)$$

$$\vec{w} = E - A = (0; 0; 5)$$

$$\vec{u} \times \vec{v} = (0 \cdot 0 - 0 \cdot 0; 0 \cdot 0 - 5 \cdot 0; 0 \cdot 0 - 0 \cdot 0) = (0; 0; 0)$$

$$\vec{w} \cdot (\vec{u} \times \vec{v}) = (0; 0; 5) \cdot (0; 0; 0) = 0 \Rightarrow |0| = 0$$