

**12 pratybos. Ortogonaliosios transformacijos  $\mathbb{R}^3$  ir jų matricos**

**Uždavinys.** Pasukite vektorių  $\mathbf{x}$  kampų  $\alpha$  vektoriaus  $\mathbf{u}$  kryptimi

1  $\mathbf{u} = (1, 1, 0)$  ,  $\alpha = 20^\circ$  ,  $\mathbf{x} = (0, 0, 20)$

Ats.: ( 4.8; -4.8; 18.8 )

2  $\mathbf{u} = (-1, 1, 0)$  ,  $\alpha = 20^\circ$  ,  $\mathbf{x} = (0, 0, -20)$

Ats.: ( -4.8; -4.8; -18.8 )

3.  $\mathbf{u} = (-1, -1, 0)$  ,  $\alpha = 40^\circ$  ,  $\mathbf{x} = (0, 0, 30)$

Ats.: ( -13.6; 13.6; 23.0 )

4.  $\mathbf{u} = (1, -1, 0)$  ,  $\alpha = 40^\circ$  ,  $\mathbf{x} = (0, 0, -30)$

Ats.: ( 13.6; 13.6; -23.0 )

5.  $\mathbf{u} = (1, 0, 1)$  ,  $\alpha = 50^\circ$  ,  $\mathbf{x} = (0, 0, 40)$

Ats.: ( 7.1; -21.7; 32.9 )

6.  $\mathbf{u} = (-1, 0, 1)$  ,  $\alpha = 50^\circ$  ,  $\mathbf{x} = (0, 0, -40)$

Ats.: ( 7.1; -21.7; -32.9 )

7.  $\mathbf{u} = (-1, 0, -1)$  ,  $\alpha = 70^\circ$  ,  $\mathbf{x} = (0, 0, 50)$

Ats.: ( 16.5; 33.2; 33.6 )

8.  $\mathbf{u} = (1, 0, -1)$  ,  $\alpha = 70^\circ$  ,  $\mathbf{x} = (0, 0, -50)$

Ats.: ( 16.5; 33.2; -33.6 )

9.  $\mathbf{u} = (0, -1, -1)$  ,  $\alpha = 80^\circ$  ,  $\mathbf{x} = (0, 0, 60)$

Ats.: ( -41.8; 24.8; 35.2 )

## Pavyzdys

Duota:

$$\mathbf{u} = (0, -1, 1), \alpha = 80^\circ, \mathbf{x} = (0, 0, -60)$$

Sprendimas.

$$\sin 80^\circ = 0.98, \cos 80^\circ = 0.17$$

$$\mathbf{u} = (0, -1, 1), \mathbf{v} = (1, 0, 0), \mathbf{w} = \mathbf{u} \times \mathbf{v}$$

$$\mathbf{u} \times \mathbf{v} = \det \begin{pmatrix} i & j & k \\ 0 & -1 & 1 \\ 1 & 0 & 0 \end{pmatrix} = j + k = (0, 1, 1)$$

$$\begin{pmatrix} 0 & 1 & 0 \\ -\frac{1}{\sqrt{2}} & 0 & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & 0 & \frac{1}{\sqrt{2}} \end{pmatrix} \begin{pmatrix} 1 & 0 & 0 \\ 0 & \cos 80^\circ & -\sin 80^\circ \\ 0 & \sin 80^\circ & \cos 80^\circ \end{pmatrix} \begin{pmatrix} 0 & 1 & 0 \\ -\frac{1}{\sqrt{2}} & 0 & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & 0 & \frac{1}{\sqrt{2}} \end{pmatrix}^T$$
$$= \begin{pmatrix} 0.17365 & -0.69636 & -0.69636 \\ 0.69636 & 0.58682 & -0.41318 \\ 0.69636 & -0.41318 & 0.58682 \end{pmatrix} \begin{pmatrix} 0 \\ 0 \\ -60 \end{pmatrix} = \begin{pmatrix} 41.782 \\ 24.791 \\ -35.209 \end{pmatrix}$$

$$\text{Ats.: } \begin{pmatrix} 41.8 \\ 24.8 \\ -35.2 \end{pmatrix}^T = (41.8; 24.8; -35.2)$$