

PI4.138r Produto escalar triplo

1. Determinar o produto escalar triplo $\vec{u} \cdot (\vec{v} \times \vec{w})$, sendo $\mathbf{u} = (1; 3; 5)$, $\mathbf{v} = (2; -1; 0)$ e $\mathbf{w} = (-3; 0; -1)$.

$$\begin{aligned}\vec{u} \cdot (\vec{v} \times \vec{w}) &= (1,3,5) \cdot ((2, -1, 0) \times (-3, 0, 1)) = \\ &= (1,3,5) \cdot (-1 \times (-1) - 0 \times 0; 0 \times (-3) - 2 \times (-1); 2 \times 0 + 3 \times (-1)) = \\ &= (1,3,5) \cdot (1; 2; -3) = 1 + 6 - 15 = -8\end{aligned}$$

2. Determinar o produto escalar triplo $\vec{u} \cdot (\vec{v} \times \vec{w})$, sendo $\mathbf{u} = (1; 0; 0)$, $\mathbf{v} = (0; 1; 0)$ e $\mathbf{w} = (0; 0; 1)$.

$$\begin{aligned}\vec{u} \cdot (\vec{v} \times \vec{w}) &= (1,0,0) \cdot ((0,1,0) \times (0,0,1)) = \\ &= (1,0,0) \cdot (1 \times 1 - 0 \times 0; 0 \times 1 - 0 \times 0; 0 \times 0 + 0 \times 1) = \\ &= (1,0,0) \cdot (1; 0; 0) = 1\end{aligned}$$

3. Determinar o produto escalar triplo $\vec{u} \cdot (\vec{v} \times \vec{w})$, sendo $\mathbf{u} = (-1; 0; 0)$, $\mathbf{v} = (0; 1; 0)$ e $\mathbf{w} = (0; 0; 1)$.

$$\begin{aligned}\vec{u} \cdot (\vec{v} \times \vec{w}) &= (-1,0,0) \cdot ((0,1,0) \times (0,0,1)) = \\ &= (-1,0,0) \cdot (1 \times 1 - 0 \times 0; 0 \times 1 - 0 \times 0; 0 \times 0 + 0 \times 1) = \\ &= (-1,0,0) \cdot (1; 0; 0) = -1\end{aligned}$$

4. Determinar o produto escalar triplo $\vec{u} \cdot (\vec{v} \times \vec{w})$, sendo $\mathbf{u} = (2; -4; 1)$, $\mathbf{v} = (0; 3; -1)$ e $\mathbf{w} = (5; -3; 3)$.

$$\begin{aligned}\vec{u} \cdot (\vec{v} \times \vec{w}) &= (2; -4; 1) \cdot ((0; 3; -1) \times (5; -3; 3)) = \\ &= (2; -4; 1) \cdot (3 \times 3 - 3 \times 1; 0 \times 3 - 5 \times (-1); 0 \times (-3) - 3 \times 5) = \\ &= (2; -4; 1) \cdot (6; -5; -15) = 12 + 20 - 15 = 17\end{aligned}$$