Linear Algebra

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Perpendicular Vectors and Zero Scalar Product

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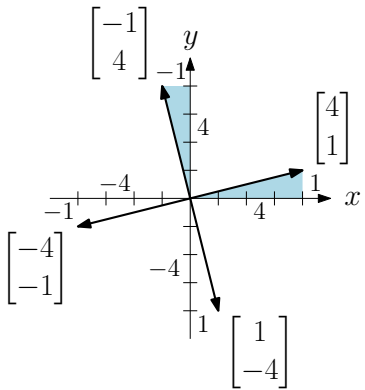
Rotating a vector by 90 degrees...

...creates a perpendicular vector...



...with swapped x- and y-coordinates, where one coordinate flips its sign.

Why?

This also rotates the triangle with the three sides *vector*, *x- and y-coordinate*.

Horizontal side (x-coordinate) and vertical side (y-coordinate) are swapped.

One side changes "sign" (right $\leftrightarrow$ left of y-axis, or above $\leftrightarrow$ below x-axis)

Scalar product of original and perpendicular vector is 0:

$$\begin{bmatrix}-1\\4\end{bmatrix} \cdot \begin{bmatrix}4\\1\end{bmatrix} = 0 \qquad \begin{bmatrix}-1\\4\end{bmatrix} \cdot \left(c \begin{bmatrix}4\\1\end{bmatrix} \right) = 0$$

Still true if perpendicular vectors have different lengths (scalar product $= 0$ only depends on the directions)