Orthogonal matrices

$$Q^{-1} = Q^T$$

$$Q Q^T = I$$

$$Q^T Q = I$$

↑ column vector

$$(Qx)^T (Qx) = \|Qx\|^2 = x^T Q^T Q x = x^T x = \|x\|^2$$

Orthogonal matrix preserves lengths