

# Linear Algebra cheat sheet

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## Vectors

dot product:  $u \cdot v = \|u\| \cdot \|v\| \cdot \cos(\phi) = u_x v_x + u_y v_y$

cross product:  $u \times v = \begin{pmatrix} u_y v_z - u_z v_y \\ u_z v_x - u_x v_z \\ u_x v_y - u_y v_x \end{pmatrix}$

enclosed angle:

$$\cos \phi = \frac{u \cdot v}{\|u\| \cdot \|v\|}$$
$$\|u\| \cdot \|v\| = \sqrt{(u_x^2 + u_y^2)(v_x^2 + v_y^2)}$$

## Matrices

### determinants

$$\det(A \cdot B) = \det(A) \cdot \det(B)$$

TODO: other rules

### common properties

symmetric:  $A = A^T$

orthogonal:  $A^T = A^{-1}$

diagonal: Eigenvalues on main diagonale

### regular / invertable / nonsingular

$$\det(A)^{-1} = \det(A^{-1})$$

### diagonalizable

If A can be diagonalized:

$$P^{-1}AP = \begin{pmatrix} \lambda_1 & & \\ & \ddots & \\ & & \lambda_n \end{pmatrix}$$

then:

$$AP = P \begin{pmatrix} \lambda_1 & & \\ & \ddots & \\ & & \lambda_n \end{pmatrix}$$

### triangular