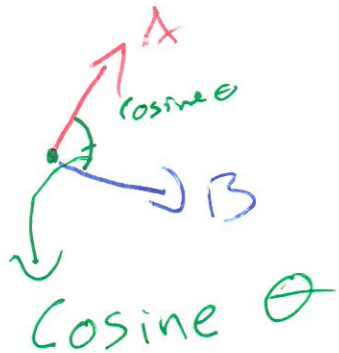


Dot Product

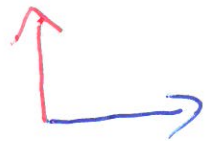


$$A \cdot B \rightarrow \text{scalar}$$

Scalar = Length of B projected on A
& vice versa.

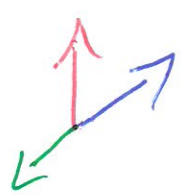


Also, if $A \perp B$, dot product = 0




$$\text{Dot Product} = a.x \cdot b.x + a.y \cdot b.y + a.z \cdot b.z$$

Cross Product \times

 $A \times B \rightarrow$ new vector
The new vector is \perp to both A & B

Cross Product

$$\begin{aligned} V_x &= A_y B_z - A_z B_y \\ V_y &= A_z B_x - A_x B_z \\ V_z &= A_x B_y - A_y B_x \end{aligned}$$


Right Handed
Cross Product

Ray / Plane Intersection

ray origin = r_o
ray direction = r_d
At a time T ,
this ray is at
 $r_o + r_d T$

$$Ax + By + Cz + D = 0$$

$$A(r_{ox} + r_{dx}T) + B(r_{oy} + r_{dy}T) + C(r_{oz} + r_{dz}T) + D = 0$$

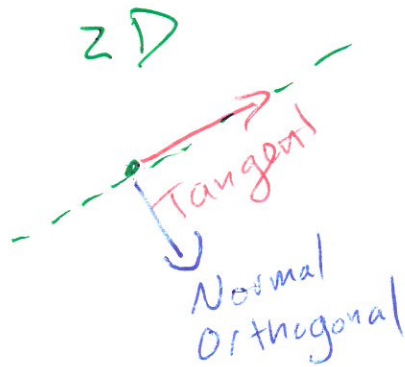
$$A r_{ox} + A r_{dx}T + B r_{oy} + B r_{dy}T + C r_{oz} + C r_{dz}T + D = 0$$

$$T(A r_{dx} + B r_{dy} + C r_{dz}) + A r_{ox} + B r_{oy} + C r_{oz} + D = 0$$

$$T(A r_{dx} + B r_{dy} + C r_{dz}) = -A r_{ox} - B r_{oy} - C r_{oz} - D$$

$$T = \frac{-A r_{ox} - B r_{oy} - C r_{oz} - D}{A r_{dx} + B r_{dy} + C r_{dz}}$$

Plane



$$Ax + By + C = 0$$

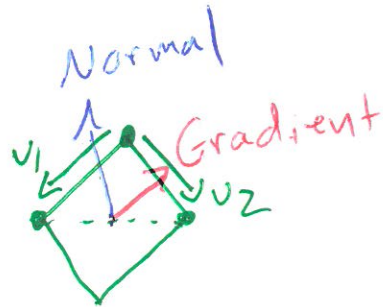
$$N_x x + N_y y + C = 0$$

$$C = -N_x x - N_y y$$

2D

$$(x, y) \rightarrow (-y, x)$$

$$(x, y) \rightarrow (y, -x)$$



$$A, B, C = v_1 \times v_2$$

$$Ax + By + Cz + D = 0$$

$$Ax + By + Cz + D = 0$$

$$D = -Ax - By - Cz$$