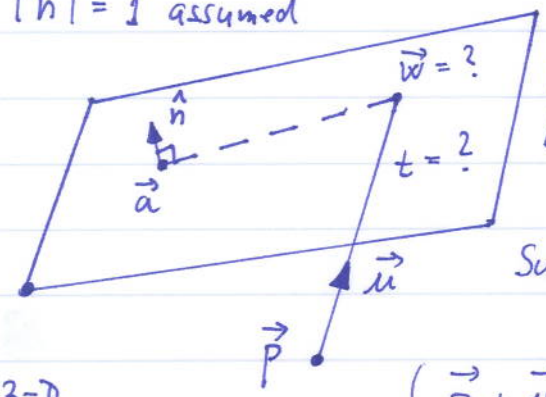
Polygon :: intercept

Find distance t to intersection $\vec{w}$ of a straight line with a plane

$|\hat{n}| = 1$ assumed



3-D

Plane: $(\vec{w} - \vec{a}) \cdot \hat{n} = 0$ (1)

Line: $\vec{w} = \vec{p} + \vec{u}t$ (2)

Substitute (2) into (1) and solve for t:

$$(\vec{p} + \vec{u}t - \vec{a}) \cdot \hat{n} = 0$$

$$t = \frac{(\vec{a} - \vec{p}) \cdot \hat{n}}{\vec{u} \cdot \hat{n}} \qquad (3)$$

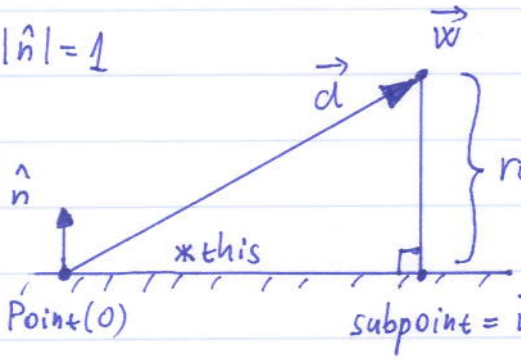
If denominator $\vec{u} \cdot \hat{n} = 0$, return no solution; otherwise proceed to get $\vec{w}$ from (2).

Polygon :: subpoint, Polygon :: distance

Drop the perpendicular from $\vec{w}$ onto *this to get the subpoint; return the SIGNED distance between $\vec{w}$ and the subpoint given the orientation of $\hat{n}$.

2-D

$|\hat{n}| = 1$

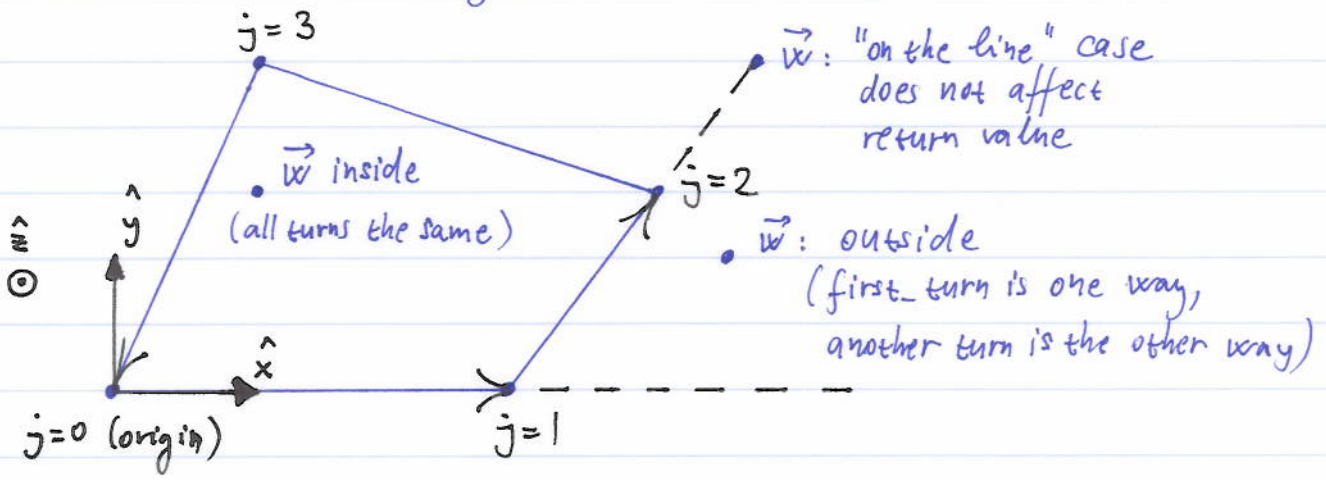


return $t = \vec{d} \cdot \hat{n}$ $\begin{cases} > 0, \text{ if } \hat{n} = \uparrow \\ < 0, \text{ if } \hat{n} = \downarrow \end{cases}$

Polygon :: contains

Determine whether point $\vec{w}$ lies inside a convex Polygon.

Local 2-D coordinate system : $|\hat{x}| = |\hat{y}| = |\hat{z}| = 1$



A convex Polygon contains $\vec{w}$ iff all "turns" are the same.

Vector3d :: get_turn

Determine which way $\vec{w}$ would have to turn to line up with $\vec{v}$.