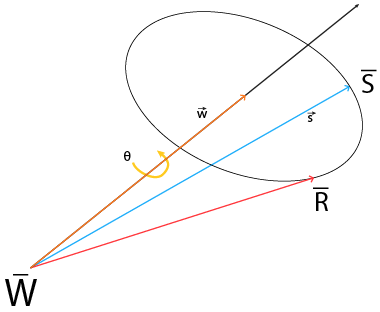
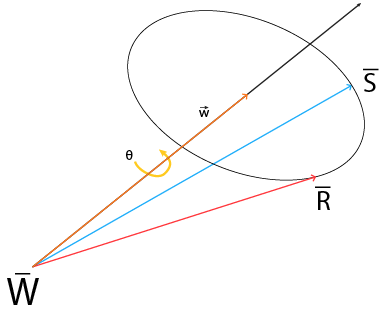
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# Rotation by and angle about axis

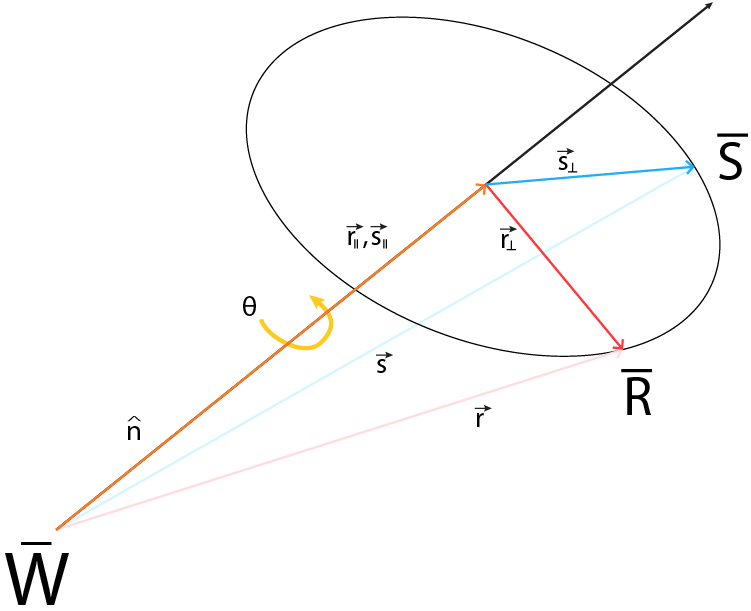


Imagine rotating about an axis, where the initial is rotated anti-clockwise at an angle to

The resulting point will be

##### How to find

Rotation does not change the area/size of the object, when rotating on an axis, it is rotating on a plane.



From the picture, we can compute these vectors

(The initial vector)(Known)

(The result vector)(Unknown)

(Normalize the rotation axis) (Known)

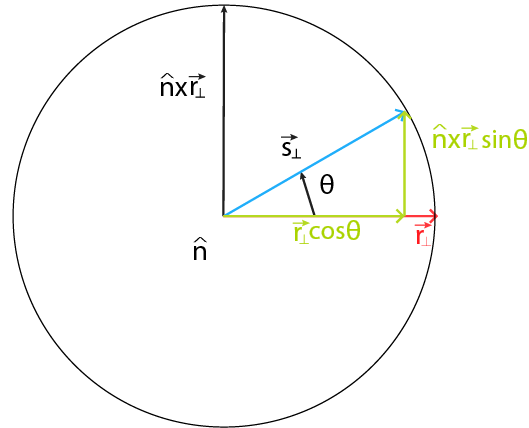
(The dot product, point lies on the same plane)

(The dot product)

(The resulting vector)

##### How to find

The bird eye view of the plane looking down from the vector Vector is point outwards and vector is the “x” axis and the “y” axis can be computed by the cross product.From the picture, we can deduce that is a rotated vector from .



Therefore the “x” and “y” components of is and respectively. The equation can be rewritten as:

Rewrite the equation:

##### Tensor Product

Tensor product is used to rewrite an expression, so that it this expression can be converted to a matrix expression.

Example from the top:

(Scalar multiplication is Commutative)

(Dot product is Commutative)

(Dot product rewritten as matrix multiplication)

(Matrix multiplication is Commutative)

(It can be represent using symbols)

##### SKEW-Symmetrix Matrix

A normal cross product can be written as:

We can rewrite the matrix as a skew matrix:

A Skew matrix transform a vector into a vector, orthogonal to the plane of these two vector, basically cross product of two vectors.

##### Convert To MAtrix

With all the conversion in place we can convert to a rotation matrix. Sub vector as an identity matrix

Vector is a priciple axis, where it can be any axis in the space.

# Negating and

If the polygon is not rotating, will be a zero vector, likewise, will be zero. The rotating matrix will result in an identity matrix.