Define the $+\hat{\imath}$ components:

	$+\hat{\imath}$	$-\hat{\jmath}$	$+\hat{k}$
$\vec{A}$	A_x	A_y	A_z
$\vec{B}$	B_x	B_y	B_z

$+\hat{\imath}\,(A_y B_z - B_y A_z)$

Constant multiple:

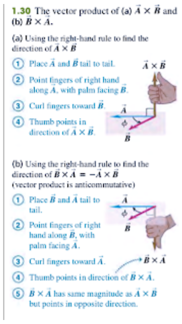
$$c(\vec{A}\times\vec{B}) = c\vec{A}\times\vec{B} = \vec{A}\times c\vec{B} \neq c\vec{A}\times c\vec{B}$$

Perpendicular vectors, when crossed will give a magnitude of 1…but order matters. In a "right-handed system" (as defined in figure 1.30) Use the following to determine the sign of unit vector crosses:

$$\overset{+}{\longrightarrow}$$
$$\hat{\imath} \quad \hat{\jmath} \quad \hat{k} \quad \hat{\imath} \quad \hat{\jmath}$$
$$\underset{-}{\longleftarrow}$$

This says that any cross product of any pair of unit vectors that are ordered moving to the RIGHT (i.e., $\hat{\imath} \to \hat{\jmath} \to \hat{k}$) will give the POSITIVE of the remaining unit vector. Products of pairs in the negative direction (i.e., $\hat{k} \to \hat{\jmath} \to \hat{\imath}$) will give a NEGATIVE result.

Positive Order	Negative Order
$\hat{\imath}\times\hat{\jmath}=\hat{k}$	$\hat{\jmath}\times\hat{\imath}=-\hat{k}$
$\hat{\jmath}\times\hat{k}=\hat{\imath}$	$\hat{\imath}\times\hat{k}=-\hat{\jmath}$
$\hat{k}\times\hat{\imath}=\hat{\jmath}$	$\hat{k}\times\hat{\jmath}=-\hat{\imath}$



questions for duff 3/28/2020 digest 1

What is the difference between scalar and vector product?

Both are the products of two vectors.

The scalar product (Dot Product):

- Multiplies only the parts of the vectors that are ***parallel*** to each other
- Results in a ***scalar***, NOT a vector. It loses its direction and represents a magnitude (though it CAN be negative)
  - It will be positive if the parallel parts are "co-parallel" → $\cos\theta > 0$
  - It will be negative if the parallel parts are "anti-parallel" → $\cos\theta < 0$

The vector product (Cross Product):

- Multiplies only the parts of the vectors that are ***perpendicular*** to each other
- Results in a vector that is perpendicular to BOTH of the parent vectors.
- The magnitude of the resulting vector can be visualized as the parallelogram that results from placing the vectors head to tail.
- Order is important for the cross product:

$$\vec{A}\times\vec{B} = -\,(\vec{B}\times\vec{A})$$

- We can also calculate the cross using the angle between the parent vectors:

$$\left|\vec{A}\times\vec{B}\right| = AB\sin\theta \text{ (use the right-hand rule to determine the direction)}$$

If the result of a vector product is a magnitude then what is the result of a scalar product called?

You've got it exactly backwards

Why is Constant multiple true like this?

Imagine two perpendicular vectors (A and B) of length 1. Their cross product AXB= 1. Now let c=2. Calculate c(AXB) → It must be 2. That means c(AXB) = cAXB NOT cAXcB becase that would equal 4!

How does the right hand rule work again? Watch these: Video 1 Video 2

Why is I and K hat negative, and J hat positive in the tabular method?

Because it HAS to be. If you want to understand where it comes from, go back and rework vector worksheet 2 (on website) and FOIL out the cross product. You'll see the minus appear because of the nature of the unit vector cross products.