CONCEPT: VECTOR (CROSS) PRODUCT USING COMPONENTS

- Sometimes you'll need to calculate $\vec{A} \times \vec{B}$ using *unit vector components*, instead of $|\mathbf{A}||\mathbf{B}|\sin\theta$
  - Vector product creates a new vector $\vec{C}$ → we need a way to calculate its ______________.

Vector Product

$\vec{A} = A_x\hat{\imath} + A_y\hat{\jmath} + A_z\hat{k}$

$\vec{B} = B_x\hat{\imath} + B_y\hat{\jmath} + B_z\hat{k}$

$\vec{C} = \vec{A} \times \vec{B} =$ ____________________

Scalar Product

$\vec{A} = A_x\hat{\imath} + A_y\hat{\jmath} + A_z\hat{k}$

$\vec{B} = B_x\hat{\imath} + B_y\hat{\jmath} + B_z\hat{k}$

$\vec{A} \cdot \vec{B} = (A_xB_x) + (A_yB_y) + (A_zB_z)$

EXAMPLE: Write $\vec{A} \times \vec{B}$ in terms of its unit vector components, if $\vec{A} = \hat{\imath} + 2\hat{\jmath}$ and $\vec{B} = -2\hat{\imath} + 3\hat{\jmath} + 4\hat{k}$

	x	y	z	x	y
$\vec{A}$					
$\vec{B}$					

$C_x =$ ________________ = ____________ = ____

$C_y =$ ________________ = ____________ = ____

$C_z =$ ________________ = ____________ = ____

CROSS PRODUCT USING COMPONENTS

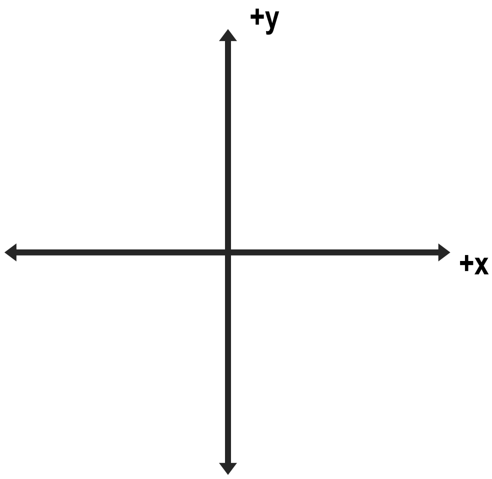
1) Bulild table of $\vec{A}$ & $\vec{B}$'s x,y,z,x,y ($\hat{\imath}, \hat{\jmath}, \hat{k}$) components
2) Write **A B – B A** for each component
3) *Always* multiply __________ components diagonally (***CROSS*** product), first ___ and then ___

- Putting this all together, you get $\vec{C} = \vec{A} \times \vec{B} =$ (____________)$\hat{\imath}$ + (____________)$\hat{\jmath}$ + (____________)$\hat{k}$

PROBLEM: Vector $\vec{A} = 4\hat{\imath} + 3\hat{\jmath}$ and $\vec{B} = -2\hat{\imath} + 3\hat{\jmath}$.

a) Find the magnitude and direction of $\vec{C} = \vec{A} \times \vec{B}$ using $\mathbf{ABsin(\theta)}$ and the Right-Hand-Rule.

b) Write $\vec{C} = \vec{A} \times \vec{B}$ in terms of unit vector components and calculate the magnitude of $\vec{C}$.



CROSS PRODUCT USING COMPONENTS

1) Bulild table of $\vec{A}$ **&** $\vec{B}$**'s x,y,z,x,y** ($\hat{\imath}, \hat{\jmath}, \hat{k}$) components

2) Write **A B – B A** for each component

3) *Always* multiply "unlike" components diagonally (***CROSS*** product), first ↘ and then ↗