

Day 6

Cross Product

- [Motivation: Torque](#)
- [Geometric definition](#)
 - $\vec{A} \times \vec{B} = \|\vec{A}\| \|\vec{B}\| \sin(\theta) \vec{n}$, where the vector $\vec{n}$ gives the direction of the resulting vector according to the right hand rule.
 - The resulting vector will be perpendicular to the vectors $\vec{A}$ and $\vec{B}$.
 - The Right Hand Rule and ["The Circle of Life"](#).
- Component Definition

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix}$$

- To see why the cross product is the determinant of this 3X3 matrix watch this [video](#) by guest lecturer James Lang
- [Example](#): Find the cross product of $\vec{A} = 2\hat{i} - 3\hat{j} + \hat{k}$ and $\vec{B} = \hat{i} + 4\hat{j}$.
Before doing this example, [review](#) how to calculate a 3 X 3 determinant. Start watching an example at 3:20. Then watch the cross product example.
- Check using dot products

 *You Try It*

Section 13.4 #5 Answer in Text

- Application of the cross product
 - [Find the area of a triangle](#)
 - [Example](#)
 - Find the area of the triangle formed by the points A(-1,0,2), B(0,-2,3) and C(4,1,1)
 - Find the equation of a plane given 3 points
 - [Example](#)
 - Find the equation of the plane formed by the points A(-1,0,2), B(0,-2,3) and C(4,1,1)

 *You Try It*

Section 13.4 #15,29c Answer in Text

- [How to do cross products on TI 89 or computer](#)