Cross Product Cont.

Friday, May 12, 2023 9:33 AM

ex 3) discuss if u, v, w are parallel:

$\vec{u} = \langle 2, -1, 0 \rangle$, $\vec{v} = \langle 1, -3, 1 \rangle$ ($\times 2$), $\vec{w} = \langle 2, -6, 2 \rangle = 2\vec{v}$

* another way to tell if parallel is thru seeing if one vector multiple of other *

solution: $\vec{u} \times \vec{v} = \begin{vmatrix} i & j & k \\ 2 & -1 & 0 \\ 1 & -3 & 1 \end{vmatrix} = -i - 2j - 5k = \langle -1, -2, -5 \rangle \neq 0$ $\vec{u}$ not parallel to $\vec{v}$

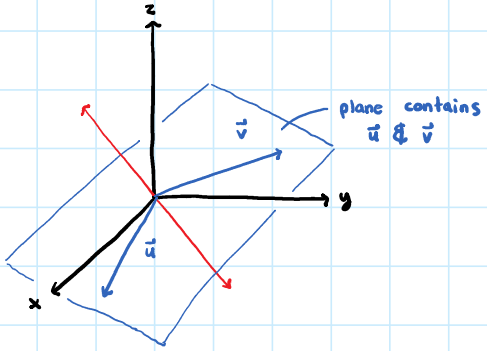
$\vec{u} \times \vec{w} = \begin{vmatrix} i & j & k \\ 2 & -1 & 0 \\ 2 & -6 & 2 \end{vmatrix} = -2i - 4j - 10k = \langle -2, -4, -10 \rangle \neq 0$ $\vec{u}$ not parallel to $\vec{w}$

$\vec{v} \times \vec{w} = \begin{vmatrix} i & j & k \\ 1 & -3 & 1 \\ 2 & -6 & 2 \end{vmatrix} = 0i - 0j - 0k = \langle 0, 0, 0 \rangle$ $\vec{v}$ parallel to $\vec{w}$

right hand rule:

$\vec{u} \times \vec{v}$ direction =

$\vec{u} \times \vec{v} = -\vec{v} \times \vec{u}$



* right hand rule: point right hand in direction of 1st vector, curl fingers in direction of 2nd vector, look a direction thumb points *

* if you want θ → use dot product not cross product bc easier *

extra: real life appearances of $\vec{u} \times \vec{v}$ (forces, torque ...)

- lorentz force: $\vec{F} = q \cdot (\vec{E} + \vec{v} \times \vec{B})$ (charge, electric, velocity, magnetic)
- maxwell's laws