Possible timeline for first lecture

9/26/2005

Title: Cross Product

- 1. Cross product (10 minutes)

    - Introduce it in an example and show the memnonic matrix way

- 2. Properties (10 minutes)

    - anti-commutative $v \times v = \vec{0}$
    - vector is perpendicular to v and w
    - length is $|v||w|\sin(\alpha)$
    - interpretation as area
    - example: area of triangle in space computation

- 3. Triple scalar product (5 minutes)

    - use to compute volume

- 3. Discussion (10 minutes)

    - when is $\vec{v} \cdot \vec{w}$ zero
    - when is $\vec{v} \times \vec{w}$ zero
    - when is $\vec{u} \cdot \vec{v} \times \vec{w}$ zero
    - orientation of $v, w, v \times w$. i.e. What is $j \times k$?

- 4. Where is the cross product used? (5 minutes)

    - physics: Lorentz force, torque, Coriolis force
    - geometry: construct normal vector
    - geometry: area and volume, distances

- 5. Planes (10 minutes)

    - how to derive the equation $ax + by + cz = d$ of a plane using the normal vector $\vec{n} = <a, b, c>$
    - how to construct the plane through 3 points.