Lyell C Read — CHs 11.3, 11.4, 11.5 Review — 10/2/2018

FOR QUIZ ON 10/3/2018

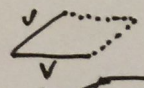
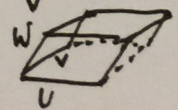
11.3 DOT PRODUCTS

- u dot $v = |u||v|\cos\theta$ | θ = between u, v
- u dot $v = u_1v_1 + u_2v_2 + u_3v_3$ if $u = \langle u_1, u_2, u_3\rangle$, $v = \langle v_1, v_2, v_3\rangle$
- $\cos\theta = u \text{ dot } v \,/\, |u||v|$
- Projection: $\text{proj}_u v = |v|\cos\theta\left(\frac{u}{|u|}\right) = \frac{u\cdot v}{|u|}\left(\frac{u}{|u|}\right) = \left(\frac{u\cdot v}{u\cdot u}\right)u$
- Scalar: $\text{scal}_u v = |v|\cos\theta = \frac{u\cdot v}{|u|}$
- dot product of $\perp$ vectors is always 0 $\cos(90) = 0$!
- $\perp$ and $\parallel$ components to a force (grav). vec $\sin\theta = \parallel$, vec $\cos\theta = \perp$

11.4 CROSS PRODUCTS

- Matrix Determinants: $\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$ for 2x2
- Matrix 3x3 Determinant:

$$\begin{vmatrix} a & -b & c \\ -d & e & f \\ g & -h & i \end{vmatrix} = a\begin{vmatrix} e & f \\ h & i \end{vmatrix} - b\begin{vmatrix} d & f \\ g & i \end{vmatrix} + c\begin{vmatrix} d & e \\ g & h \end{vmatrix}$$ inverse above, 2x2

- cross Product: $u \times v = |u||v|\sin\theta$ between u, v
  - perpendicular to both u, v. Use Right Hand Rule.
- Area of a parallelogram  $= |u||v|\sin\theta$
- Area of a parallelepiped  $u \times v \cdot w$
- Torque $\tau = |F||L|\sin\theta = |F \times L|$

- cross Product w/ Matrices $u = \langle u_1, u_2, u_3 \rangle \times v = \langle v_1, v_2, v_3 \rangle$

$$\begin{vmatrix} i & j & k \\ v_1 & v_2 & v_3 \\ v_1 & v_2 & v_3 \end{vmatrix} \rightarrow \text{Determinant} \rightarrow i x \; j y \; k z \rightarrow \langle \rangle$$

- Area of Δ_{uv} $\frac{1}{2}|u \times v| = \frac{1}{2}|u||v|\sin\theta$ or use Matrices

11.5 VECTOR DEFINED FUNCTIONS

- line through point, in direction $r(t) = \text{point} + t\,\text{dir}$.
- Line through u, v $v - u = \text{dir}$ $r(t) = u + t * \text{dir}$
- Line dir from eq (remove everything but what is mult by t)