Introduction

- Cardinal Rule: If you don't understand something, ask a question, as it will probably do more good than sitting in your seat thinking "Man, I don't understand ANYTHING this guy is saying!"

Dot Products

- The dot product is large when the size of the vectors are large and the vectors are close to being parallel.

- If vectors $\mathbf{a}, \mathbf{b}$ are perpendicular, $\mathbf{a} \cdot \mathbf{b} = \mathbf{0}$

- If vectors $\mathbf{a}, \mathbf{b}$ are parallel, $\mathbf{a} \cdot \mathbf{b} = |\mathbf{a}||\mathbf{b}|$

- The above two statements can be conflated to the overall rule: $\mathbf{a} \cdot \mathbf{b} = |\mathbf{a}||\mathbf{b}|\mathbf{Cos}(\theta)$, where θ is the angle between the vectors.

- If $\mathbf{a}, \mathbf{b}$ are in cartesian co-ordinates, $\mathbf{a} = \langle w, t, u \rangle, \mathbf{b} = \langle f, g, h \rangle$, then $\mathbf{a} \cdot \mathbf{b} = wf + tg + uh$.

Cross Products

- For vectors $\mathbf{a}, \mathbf{b}$, the length of the cross product $\mathbf{a} \times \mathbf{b}$ is the area of the parallelogram determined by the vectors $\mathbf{a}$ and $\mathbf{b}$. This length also happens to equal $|\mathbf{a}||\mathbf{b}|Sin(\theta)$.

- The cross product of $\mathbf{a}$ and $\mathbf{b}$ is always perpendicular to both $\mathbf{a}$ and $\mathbf{b}$.

- The direction of the cross product is given by the right hand rule.

- The cross product of the vectors $\langle a, b, c\rangle$ and $\langle d, e, f\rangle$ can be calculated by taking the determinant of the matrix $\begin{bmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ a & b & c \\ d & e & f \end{bmatrix}$