Lecture Notes Calculus 3

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1 Orthongonality

The word orthogonal is an extension of the idea of perpendicularity to things that dont have a direction.

$$\text{orthongonal} \approx \text{perpendicular} \approx \text{normal}$$

perpendicular applies to geometric objects meanwhule normal applies to vector objects

$$\vec{a} \text{ and } \vec{b} \text{ are } \underline{\text{orthongonal}} \text{ if and only if } \vec{a} \cdot \vec{b} = 0$$

$$\vec{O} \text{ is orthogonal to all vectors.}$$

2 Directional Cosines

These are the cosines of the angles that a particular vector makes with the three different positive axes.

definitions:

- Angle with positive x-axis: Alpha α
- Angle with positive y-axis: Beta β
- Angle with positive z-axis: Gamma γ

$$\text{given } \vec{a} =< x, y, z >$$

$$\cos\alpha = \frac{\vec{a}\cdot\hat{i}}{|\vec{a}||\hat{i}|} = \frac{x}{|\vec{a}|}$$

$$\cos\beta = \frac{\vec{a}\cdot\hat{j}}{|\vec{a}||\hat{j}|} = \frac{y}{|\vec{a}|}$$

$$\cos\gamma = \frac{\vec{a}\cdot\hat{j}}{|\vec{a}||\hat{j}|} = \frac{z}{|\vec{a}|}$$

another way to find the directional cosines is to find the unit vector, and each component will correspond to the appropriate directional cosine

3 Projections

Scalar Projection of $\vec{a}$ onto $\vec{b} = comp_{\vec{b}}\vec{a}$