Week 9 Day 2

Integrals!!!

Make sure you know your neighbors' names. Then take about 2 minutes to discuss:

On $\mathbb{P}_2$, define an inner product by setting

$$\langle p, q \rangle = \int_{-1}^{1} p(t)q(t)\,dt.$$

Let $U = \mathrm{span}\{1\}$ inside $\mathbb{P}_2$. In other words, U is the subspace of constant functions. Find a basis for the orthogonal complement $U^\perp$.

Orthogonal Projection

1. What is the orthogonal projection of $(-1, 4, 3)$ onto $U = \text{span}\{(1, 0, 1), (-1, 0, 1)\}$?

(A) $(-1, 4, 3)$

(B) $(-1, 0, 3)$

(C) $(-1, 4, 0)$

(D) None of the above

2. Suppose U is a subspace of an inner product space V and v is a vector in V such that the closest point in U to v is the zero vector. Then...

(A) v must be in $U^\perp$.

(B) v cannot be in $U^\perp$.

(C) Can't say for sure either way.

3. On $\mathbb{P}_2$, consider the inner product

$$\langle p, q \rangle = \int_{-1}^{1} p(t)q(t)\,dt.$$

Let $U = \operatorname{span}\{1\}$ inside $\mathbb{P}_2$. What is the projection of $1 + t + t^2$ onto U?