Yiddish word of the day

______	______	=	דער פֿעטער · די באָבע
______	______		די מומע · דער זײדע
______	______		דער קוזין · די שוועסטער
______	______		די געשוויסטער · דער זין

Yiddish phrase of the day

"mit shnei ken men nisht makhn gulmolkhes" = מיט שנײ קען מען נישט מאַכן גאָלמאָלכעס!

" " =

TAKE THE EVALS!!!

Currently at 23% !!!

Orthogonal Stuff

First in $\mathbb{R}^n$

- How to use LA to talk about "distance" and "length"?

Def: Let $\vec{u} = \begin{pmatrix} u_1 \\ \vdots \\ u_n \end{pmatrix}$, $\vec{v} = \begin{pmatrix} v_1 \\ \vdots \\ v_n \end{pmatrix}$ in $\mathbb{R}^n$.

Define $\vec{u} \cdot \vec{v} :=$

Def: 1) Let $\vec{u}$ in $\mathbb{R}^n$. Then define the ______ of $\vec{u}$ to be ______

2) Let $\vec{u}, \vec{v}$ in $\mathbb{R}^n$. The ______ is defined to be ______

Now let V be VS.

Can define "distance" between arbitrary vectors

Let $\mathcal{B}$ be basis. Then taking coordinate vectors gives vectors in $\mathbb{R}^n$

Def: Let v, w in V. Then the

$\operatorname{dist}(v,w) :=$

Def 2: Let $\vec{u}, \vec{v}$ in $\mathbb{R}^n$. Then we say $\vec{u}, \vec{v}$ are

__________ if $\vec{u} \cdot \vec{v} =$ __________

- Say $(\vec{u}_1, \ldots, \vec{u}_r)$ are __________

  if __________

- **Fact:** If $(\vec{u}_1, \ldots, \vec{u}_r)$ are __________

  then they are __________

Recall: If $\vec{b}$ in span$(\vec{v}_1, \dots, \vec{v}_n)$ then

$\vec{b} =$

- However, to find these it's kind annoying.

- Unless

In this case

$=$

Having a denominator is always annoying. Hence the following def

Def: An orthogonal sequence $(\vec{v}_1, \ldots, \vec{v}_n)$ is said to be ____________ if ____________

Goal: Have a ____________ for $\mathbb{R}^n$.

Why?

- **Def**: We say $Q = \begin{pmatrix} \vec{v}_1 & \cdots & \vec{v}_n \\ \downarrow & & \downarrow \end{pmatrix}_{n \times n}$

  is an ____________________

  if ____________________

Facts: Let $Q = \begin{pmatrix} \vec{v}_1 & \cdots & \vec{v}_n \\ \downarrow & & \downarrow \end{pmatrix}_{n \times n}$. Then the following are equivalent

1) Q is a ______________ matrix

2) For any $\vec{v}$ in $\mathbb{R}^n$ ______________

3) For any $\vec{v}, \vec{w}$ in $\mathbb{R}^n$ ______________

What this means: Let Q be an ___________

- Q preserves ___________ (by 2)
- Q preserves ___________ (by 3)

(Google "conformal maps" and "isometries")

Practically

- If you want to change a vector without changing it (move it around but not deform it) then an Orthogonal matrix is the way to go.

Facts

- Can always make a basis into ON basis

- Let $A = \begin{pmatrix} \vec{v}_1 & \cdots & \vec{v}_n \\ \downarrow & & \downarrow \end{pmatrix}_{m \times n}$ with $\vec{v}_1 \ldots \vec{v}_n$ LI, Then can decompose A as

$$A = QR$$

with Q "orthogonal"

R "upper triangular"

("QR factorization") (8.6 has applications of this)

(Sections 8.4/8.5 in book are really cool (especially 8.5) but we won't discuss them. Look at them though!!! Cool stuff!!!!!!)