LARSON—MATH 511—CLASSROOM WORKSHEET 06
Gilbert Strang Lectures 2 & 3.

More on Strang's Lectures

1. What is an *orthogonal* matrix?

2. What are examples?

3. What is a *permutation matrix*?

4. Strang claims that if Q is an orthogonal matrix then $||Q\hat{x}|| = ||\hat{x}||$, for every vector $\hat{x}$. Why is this true?

Sage/CoCalc

(a) Start the Chrome browser.

(b) Go to `http://cocalc.com`

(c) Login (likely using **your VCU email address**).

(d) You should see an existing Project for our class. Click on that.

(e) Click "New", then "Sage Worksheet", then call it **c06**.

5. How can we input the vectors $\hat{u} = \begin{bmatrix} 2 \\ 3 \\ 5 \end{bmatrix}$ and $\hat{v} = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$.

6. Find $\hat{u}\hat{v}^T$.

7. We know the rank of $\hat{u}\hat{v}^T$ is 1. Check this with SAGE.

8. Input some orthogonal matrix Q. Check that $||Q\hat{x}|| = ||\hat{x}||$ for various vectors $\hat{x}$.

9. How can we use SAGE to *check* that a matrix Q is orthogonal?

Getting your classwork recorded

When you are done, before you leave class...

1. Click the "Make pdf" (Adobe symbol) icon and make a pdf of this worksheet. (If CoCalc hangs, click the printer icon, then "Open", then print or make a pdf using your browser).

2. Send me an email with an informative header like "Math 511—c06 worksheet attached" (so that it will be properly recorded).

3. Remember to attach today's classroom worksheet!