Announcements Feb 26

- Keeps tabs on your grades in TSquare
- Homework 5 due now
- Quiz 5 on 2.3 and 2.5 in class today
- WebWork 2.8 and 2.9 due Thursday
- Midterm 2 in class Friday Mar 11 on Chapters 2 & 3
- Office Hours Tuesday and Wednesday 2-3, after class, and by appt in Skiles 244 or 236
- LA Office Hours: Scott Mon 12-1, Yashvi Mon 2-3, Shivang Tue 5-6, Baishen Wed 4-5, Matt Thu 3-4
- Math Lab, Clough 280
    - Regular hours: Mon/Wed 11-5 and Tue/Thu 11-5
    - Math 1553 hours: Mon-Thu 5-6 and Tue/Thu 11-12
    - LA hours: Matt Tue 11-12, Scott Tue 5-6, Baishen Thu 11-12, Yashvi/Shivang Thu 5-6

The Invertible Matrix Theorem

True/False

Suppose A is an $n \times n$ matrix. Are the following statements always true or sometimes false? Explain your answer.

1. If A has two identical columns then A is not invertible.
2. If A is invertible then the columns of A^{-1} span $\mathbb{R}^n$.
3. If $Ax = b$ is consistent for all b in $\mathbb{R}^n$ then $Ax = 0$ has only the trivial solution.
4. If $Ax = 0$ has the trivial solution then A is invertible.

The Invertible Matrix Theorem

Which of the following are equivalent to the statement that A is invertible?

(m) rows of A span $\mathbb{R}^n$

(n) rows of A are linearly independent

(o) $Ax = b$ has exactly one solution for all b in $\mathbb{R}^n$

(p) $\det(A) \neq 0$, where $\det(A)$ is the volume of the parallelepiped formed by the columns of A

(q) A^3 is invertible

LU decompositions

Find an LU decomposition for A and use it to solve $Ax = b$.

$$A = \begin{pmatrix} 2 & 0 & 1 \\ -2 & 1 & 1 \end{pmatrix} \qquad b = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$$

Find an LU decomposition for A and use it to solve $Ax = b$.

$$A = \begin{pmatrix} 1 & 0 \\ -2 & 1 \\ 3 & 2 \end{pmatrix} \qquad b = \begin{pmatrix} 3 \\ -7 \\ 7 \end{pmatrix}$$

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Subspaces

Which of the following are subspaces of $\mathbb{R}^4$? Explain your answer.

$$V = \left\{ \begin{pmatrix} x \\ y \\ z \\ w \end{pmatrix} \text{ in } \mathbb{R}^4 \ : \ x + y = 0 \text{ and } z + w = 0 \right\}$$

$$W = \left\{ \begin{pmatrix} x \\ y \\ z \\ w \end{pmatrix} \text{ in } \mathbb{R}^4 \ : \ xy - zw = 0 \right\}$$

Find bases for the column space and the null space:

$$A = \begin{pmatrix} 1 & 0 & 1 & 1 \\ -2 & 1 & 1 & 0 \\ 7 & -2 & 1 & 3 \end{pmatrix}$$

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Subspaces

Find bases for the column space and the null space:

$$A = \begin{pmatrix} 1 & 0 & 1 & 1 \\ -2 & 1 & 1 & 0 \\ 7 & -2 & 1 & 3 \end{pmatrix}$$