18.06 - Spring 2005 - Problem Set 1

February 10, 2005

This problem set on lectures $1-3$ is due Wednesday (February 9th), at 4 PM, in 2-106. Make sure to include your **name and recitation number** in your homework! The numbers of the sections and exercises refer to "Introduction to Linear Algebra, **3rd Edition**, by Gilbert Strang."

Please staple your solution as first page of your homework. Remember to PRINT your name, Recitation number and Instructor name.

Lecture 1:

- **Read:** book sections 1.1 to 2.1.
- **Work:** book section 1.1 (exercise 28), 1.2 (exercise 29 and 31), and 2.1 (exercises 18 and 19).

Lecture 2:

- **Read:** book sections 2.2 and 2.3.
- **Work:** book section 2.2 (exercises 5, 7, 15, 19 and 26), and 2.3 (exercises 3, 11, 19 and 27).

Lecture 3:

- **Read:** book sections 2.4 and 2.5.
- **Work:** book section 2.4 (exercises 2, 24, 33).

Challenge Problem for 3 by 3 systems $Ax = b$

Success would be 3 columns of A whose combinations give every vector $\mathbf{b}$, which matches with 3 planes in the row picture that intersect at one point (the unique solution $\mathbf{x}$). Give numerical examples of these two types of failure:

- 3 columns lie on the same line.
  The 3 planes in the row picture are ...?

  3 planes are parallel
  Then if $\mathbf{b}$ happens to lie on that line of columns, the 3 planes meet in a ...?
- 3 columns in the same plane, but no two on the same line.
  Then 3 planes do what? Show by a sketch. Which $\mathbf{b}$'s allow $Ax = b$ to be solved?