February 5, 2004

This problem set on lectures 1 – 3 is due Wednesday (February 11th), at 4 PM, at 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.”

Lecture 1:
- **Read**: book sections 1.1 to 2.1.
- **Work**: book section 1.1 (exercise 28), 1.2 (exercise 29), 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 and 19), and 2.3 (exercises 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** $Ax = b$

Find the possible failures in the column picture and the row picture, and match them up. Success would be 3 columns whose combinations give every vector $b$, which matches with 3 planes in the row picture that intersect at one point (the unique solution $x$). Give numerical examples of these two types of failure:

- 3 columns lie on the same line  3 planes are parallel
  (then if $b$ 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? Which $b$’s are OK?

Now give numerical examples of other types of failure in the column and row pictures.

Please staple your solution as first page of your homework.