18.06 - Spring 2004 - Problem Set 1

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.