

**Homework Set 3, Due Thursday, Feb. 3, 2005***(Late papers will be accepted until 4 PM on Fri., Feb. 4)*

All of these problems are from our text by Strang (3rd edition). I believe you will find them both short and routine.

1. *This problems refer to the “row and column” pictures discussed in Strang at the beginning of Chapter 2.*
  - a) Draw the row and column pictures in two planes for the equations  $x - 2y = 0$ ,  $x + y = 6$ .
  - b) [Fill in the blanks] For two linear equations in three unknowns  $x, y, z$ , the row picture will show \_\_\_\_ [lines or planes?] in \_\_\_\_ [2 or 3?] dimensional space. The column picture is in \_\_\_\_ [2 or 3?] dimensional space. The solutions normally lie on a \_\_\_\_.
  - c) [Fill in the blanks] For four linear equations in two unknowns  $x$  and  $y$ , the row picture shows four \_\_\_\_\_. The column picture is in \_\_\_\_\_-dimensional space. The equations have no solution unless the vector on the right side is a combination of \_\_\_\_\_.
  
2. (Strang, p. 34 #33) Run the MATLAB code below for  $t = 1$ ,  $t = 0.5$  and  $t = 1.5$ . It allows you to input  $x_0$  with a mouse click, by `ginput`. With  $t = 1$ , the following matrix  $A$  rotates vectors by  $\theta$ . The plot will show  $Ax_0, A^2x_0, \dots$  going around a circle. ( $t > 1$  will spiral out and  $t < 1$  will spiral in). You can change  $\theta$  and the stop at  $j = 10$ .

```
theta = 15*pi/180; t = 1.0;
A = t*[cos(theta) - sin(theta) ; sin(theta) cos(theta)];
disp('Click to select starting point')
[x1 , x2] = ginput(1); x = [x1 ; x2];
for j = 1:10
    x = [x A*x(:, end)];
end
plot(x(1,:), x(2,:), 'o')
hold off
```

How should you modify this so that the rotation is in the opposite direction?

3. Strang, p. 43 #11, #12, #13, and #14. [All of these are short].
4. Strang p. 44 #21 - #22.
5. Strang p. 55 #25.
6. Strang p. 55 #27.
7. Strang p. 65 #5 and #6.
8. Strang p. 66 #11.
9. Strang p. 68 #21 and #24.
10. Strang p. 69 #30.
11. Strang p. 70 #33 and #34.
12. Strang p. 79 #5 and #6.
13. Strang p. 80 #19 and #20.
14. Strang p. 82 #39.
15. Strang p. 82 #41.