HOMEWORK ASSIGNMENT 1

Name: **Due:** Friday Jan 31

Problem 1: Strang 2.2 #4 page 52

What multiple of the first equation should be *subtracted* from the second equation in order to proceed with the Gaussian elimination algorithm?

$$
\begin{aligned}
2x - 4y &= 6 \\
-x + 5y &= 0.
\end{aligned}
$$

After this elimination step, solve the resulting triangular system. If the right side of the first equation changes to -6 (from the current 6), what is the new solution?

Ans:

Problem 2: Strang 2.2 #5 page 52

Choose a right side for the second equation which gives no solution and another right side which gives infinitely many solutions to the following linear system. What are two of these solutions?

$$
\begin{aligned}
3x + 2y &= 10 \\
6x + 4y &=
\end{aligned}
$$

Ans:

Problem 3: Strang 2.2 #6 page 52

Choose a coefficient b which makes the following system singular (i.e., degenerate). Then choose a g on the right side which gives infinitely many solutions,

$$\begin{aligned} 2x + by &= 16 \\ 4x + 8y &= g. \end{aligned}$$

Ans:

Problem 4: Strang 2.2 #7 page 52

For which a does elimination break down (1) temporarily and (2) permanently?

$$\begin{aligned} ax + 3y &= -3 \\ 4x + 6y &= 6. \end{aligned}$$

Solve for x and y after fixing the temporary breakdown in case (1) with a suitable row exchange.
Ans:

Problem 5: Strang 2.2 #10 page 52

Draw the lines $x+y=5$ and $x+2y=6$ in the xy plane. Then draw the line $y=$ __ which comes from elimination. The line $5x-4y=c$ will go through the solution of these equations if $c=$ __.
Ans:

Problem 6: Strang 2.2 #13 page 53

Apply Gaussian elimination (circle the pivots) and then back-substitute to solve for x, y, z in the following linear system:

$$\begin{aligned} 2x - 3y \phantom{{}+z} &= 3 \\ 4x - 5y + z &= 7 \\ 2x - y - 3z &= 5. \end{aligned}$$

List the *three* operations that you used in the following format: Subtract __ times Equation __ from Equation __.
Ans:

Problem 7: Strang 2.2 #19 page 54

Which number q makes the following system singular (i.e., degenerate) and which number t gives infinitely many solutions for that choice of q?

$$\begin{aligned} x + 4y - 2z &= 1 \\ x + 7y - 6z &= 6 \\ 3y + qz &= t. \end{aligned}$$

Ans:

Problem 8

Write the equations of *three planes* in 3-dimensional space so that

(1) no two of them are parallel and yet their common intersection is empty,
(2) all three of them meet in a single line.

Ans: