I. Consider the following vectors.

$$\mathbf{v} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}, \mathbf{w} = \begin{bmatrix} -3 \\ 1 \end{bmatrix}$$

(a) Draw the two vectors.

(b) Compute and draw the vectors $\mathbf{v} - 2\mathbf{w}$ and $3\mathbf{v} + \mathbf{w}$.

(c) Find a number c so that $\mathbf{v} - c\mathbf{w}$ is perpendicular to $\mathbf{w}$. Draw the two perpendicular vectors.

II. For the following system of linear equations, draw the "row picture" and the "column picture", and then find the solution.

$$\begin{cases} 3x + 2y = 6 \\ 2x + 3y = 6 \end{cases}$$

III. Problem set §1.2, exercises 1, 4, 5, 10, 13, and 17.

IV. Use the elimination method to reduce each system to an upper triangular one. For each step of the algorithm, jot down a descrition of the step you are performing (*e.g.*, $(\textbf{eqn } 1) - (3)(\textbf{eqn } 2) \to (\textbf{eqn } 2)$). Then, use back subsitution to find a unique solution, or else show that the system has 0 or infinitely many solutions.

(a) $\begin{cases} 2x - 3y = 5 \\ -4x + 6y = 8 \end{cases}$

(b) $\begin{cases} 2x + y = -2 \\ 3x + 3y = 0 \end{cases}$

(c) $\begin{cases} 3x - 4y + z = -7 \\ 6x - 8y - z = -16 \\ x + 2y + 2z = 6 \end{cases}$

V. Consider the following system of equations with unknown coefficients a, b, c, and d.

$$\begin{cases} 2x + y + 3z = a \\ 5y + 7z = b \\ dz = c \end{cases}$$

(a) Choose values of a, b, c, d so that there is no solution. Explain why there is no solution.

(b) Choose values of a, b, c, d so that there are infinitely many solutions. Explain why there are infinitely many solutions.

VI. Problem set §1.3, exercises 1, 2, 3, 5, and 10.