

CE 311K - McKinney
HW-8 Linear Equations

Problem 1. Given the system of equations

$$0.77x_1 + 6x_2 = 14.25$$

$$1.2x_1 + 1.7x_2 = 20$$

- Solve graphically
- On the basis of the graphical solution, what do you expect regarding the condition of the system?
- Solve by elimination of unknowns.

Problem 2. Use Gauss Elimination to solve the following systems of linear equations. Show all steps in the computation.

$$x_1 + x_2 + x_3 = 6$$

$$3x_1 + 2x_2 + x_3 = 10$$

$$-2x_1 + 3x_2 - 2x_3 = -2$$

Problem 3. The series expansion for sine x is $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$. Starting with the simplest version, $\sin x \approx x$, add terms, one at a time in order to estimate $\sin(\frac{\pi}{2})$. After each new term is added, compute the true error and the approximate relative error. Add terms until the absolute value of the approximate relative error falls below a stopping criterion of 0.001%. Use a spreadsheet.

Problem 4. Start from an initial guess of $x_1^0 = x_2^0 = x_3^0 = 0.0$, show the first 2 iterations of the Gauss-Seidel method for the solution of the system of equations in problem 3. Compute the error after the second iteration.

$$-12x_1 + x_2 - 8x_3 = -80$$

$$x_1 - 6x_2 + 4x_3 = 13$$

$$-2x_1 - x_2 + 10x_3 = 90$$