Math 151A

Extra Credit HW #8, due on Friday, December 6, 2024 at 11:59pm PST.

[**1**] For the following systems obtain a solution (if it exists) via a graphical method.

a)

$$\begin{aligned} x_1 + 2x_2 &= 3 \\ x_1 - x_2 &= 0 \end{aligned}$$

b)

$$\begin{aligned} x_1 + 2x_2 &= 3 \\ 2x_1 + 4x_2 &= 6 \end{aligned}$$

[**2**] Use Gaussian Elimination to solve the following linear systems, if possible, and determine if row interchanges are necessary.

a)

$$\begin{aligned} 2x_1 - 1.5x_2 + 3x_3 &= 1 \\ -x_1 + 2x_3 &= 3 \\ 4x_1 - 4.5x_2 + 5x_3 &= 1 \end{aligned}$$

b)

$$\begin{aligned} x_2 - 2x_3 &= 4 \\ x_1 - x_2 + x_3 &= 6 \\ x_1 - x_3 &= 2 \end{aligned}$$

[**3**] Given the linear system

$$\begin{aligned} 2x_1 - 6\alpha x_2 &= 3 \\ 3\alpha x_1 - x_2 &= 3/2 \end{aligned}$$

a) Find the value(s) of α for which the system has no solutions.

b) Find the value(s) of α for which the system has infinite solutions.

c) Assuming a unique solution exists for a given α, find a formula for the solution.

[**4**] Use Gaussian Elimination with and without partial pivoting and three-digit chopping arithmetic to solve the following system. Compare the result you obtain with the two methods with to the actual solution and comment on your results.

$$0.03x_1 + 58.9x_2 = 59.2$$
$$5.31x_1 - 6.10x_2 = 47.0$$

Actual solution $x_1 = 10, x_2 = 1$

[**5**] Find the values of α that make the following matrix singular

$$A = \begin{bmatrix} 1 & -1 & \alpha \\ 2 & 2 & 1 \\ 0 & \alpha & -\frac{3}{2} \end{bmatrix}$$