

1 Review 4

1.1 Solving systems of equations

Consider the system

$$\begin{bmatrix} 7 & 2 \\ 6 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -1 \\ 4 \end{bmatrix}$$

That is we are trying to determine the vector $\begin{bmatrix} x & y \end{bmatrix}^T$ such that the equality above is valid. Clearly,

$$\begin{aligned} \begin{bmatrix} x \\ y \end{bmatrix} &= \begin{bmatrix} 7 & 2 \\ 6 & 3 \end{bmatrix}^{-1} \begin{bmatrix} -1 \\ 4 \end{bmatrix} \\ &= \begin{bmatrix} -\frac{11}{9} \\ \frac{34}{9} \end{bmatrix} \end{aligned}$$

To verify this compute the product (you should do this)

$$\begin{bmatrix} 7 & 2 \\ 6 & 3 \end{bmatrix} \begin{bmatrix} -\frac{11}{9} \\ \frac{34}{9} \end{bmatrix}$$

However, SWP can be used to solve the original system of equations directly just by using the solve menu item under the compute menu. Specifically, by highlighting the expression below and choosing solve

$$\begin{bmatrix} 7 & 2 \\ 6 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -1 \\ 4 \end{bmatrix}$$

we get, Solution is: $\begin{bmatrix} -\frac{11}{9} \\ \frac{34}{9} \end{bmatrix}$

Exercise 1 Solve the system

$$\begin{bmatrix} 8 & -6 & -4 & 1 \\ -9 & -4 & 6 & 6 \\ 8 & 6 & 7 & -5 \\ 7 & -5 & 7 & 7 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 3 \\ -5 \\ 3 \\ 1 \end{bmatrix}$$

2 Matrix submenu

Exercise 2 Use the items in the matrix submenu of the compute menu to find the following for the matrix

$$\begin{bmatrix} 8 & -6 & -4 & 1 \\ -9 & -4 & 6 & 6 \\ 8 & 6 & 7 & -5 \\ 7 & -5 & 7 & 7 \end{bmatrix}$$

1. *The PLU Decomposition.* What is the product of the matrices in this decomposition?
2. *The QR Decomposition*
3. *Use Gaussian elimination on the given matrix to obtain*

$$\begin{bmatrix} 8 & -6 & -4 & 1 \\ 0 & 12 & 11 & -6 \\ 0 & 0 & \frac{545}{48} & \frac{7}{4} \\ 0 & 0 & 0 & \frac{5087}{1090} \end{bmatrix}$$

4. *The singular values of the given matrix*
5. *The rank of the given matrix?*

Exercise 3 Use the *random matrix* command in the *matrix* submenu of the *compute* menu (not *Fill Matrix*) to generate a 7×7 matrix with random integer entries from the interval $[-7, 8]$.

3 Review 4

Instructions: Create a file containing the answers to the exercises in this lesson. You do not need to include the definitions and examples. Submit a .tex version of your file to teprice@uakron.edu. The name of your files should be of the form **yourlastnameR4.tex**. All calculations should be done using the CAS in SWP.