

**Quiz:**

## Problem Set 2.1

20. ■ Solve the equations  $\mathbf{Ax} = \mathbf{b}$ , where

$$\mathbf{A} = \begin{bmatrix} 3.50 & 2.77 & -0.76 & 1.80 \\ -1.80 & 2.68 & 3.44 & -0.09 \\ 0.27 & 5.07 & 6.90 & 1.61 \\ 1.71 & 5.45 & 2.68 & 1.71 \end{bmatrix} \quad \mathbf{b} = \begin{bmatrix} 7.31 \\ 4.23 \\ 13.85 \\ 11.55 \end{bmatrix}$$

By computing  $|\mathbf{A}|$  and  $\mathbf{Ax}$  comment on the accuracy of the solution.

Handwritten solution for the system  $\mathbf{Ax} = \mathbf{b}$  using Gaussian elimination. The matrix  $\mathbf{A}$  is transformed into an upper triangular form  $\mathbf{U}$  using row operations  $L_{10}$ ,  $L_{11}$ , and  $L_{12}$ . The resulting system is solved for  $x_3$ ,  $x_2$ ,  $x_1$ , and  $x_0$  in reverse order. The final solution vector  $\mathbf{x}$  is shown as  $\begin{bmatrix} x_0 \\ x_1 \\ x_2 \\ x_3 \end{bmatrix}$ .

$\mathbf{x}$  is  $[-2.31103973 \quad 0.32658729 \quad -0.02315412 \quad 8.0608364]$

$|\mathbf{A}|$  is  $9.751927560000011$   $||\mathbf{A}||$  is  $12.829220553096746$

The result of  $\mathbf{x}$  is  $[-2.31103973 \quad 0.32658729 \quad -0.02315412 \quad 8.0608364]$

$\mathbf{Ax}$  is  $[7.31 \quad 4.23 \quad 13.85 \quad 11.55]$

The error between  $\mathbf{Ax}$  and  $\mathbf{b}$  is  $[1.21501836e-16 \quad 0.00000000e+00 \quad 0.00000000e+00 \quad 1.5316]$

Because  $|A|$  isn't much smaller than  $\|A\|$ , the result should be accurate.