

Pset#2: Solving systems of equations with Gaussian Elimination

Precalculus

Spring Semester 2022

Herbert H. Lehman High School

February 15, 2022

Be sure to: Complete all work in your notebook. Upload a photo to Google Classroom to submit. Show all work!

1. Consider the following system of equations:

$$\begin{array}{rrcrcl} x & + & y & + & z & = & 48 \\ -x & + & 2y & + & 2z & = & -24 \\ 2x & - & 6y & + & 4z & = & 12 \end{array}$$

- (a) Steps (i)–(iii) below illustrate the conversion of this system into row–echelon form. For each step, explain how it was derived from the previous step. Be as explicit as possible!

$$\begin{array}{l} \text{i.} \end{array} \quad \begin{array}{rrcrcl} x & + & y & + & z & = & 48 \\ & & 3y & + & 3z & = & 24 \\ 2x & - & 6y & + & 4z & = & 12 \end{array}$$

$$\begin{array}{l} \text{ii.} \end{array} \quad \begin{array}{rrcrcl} x & + & y & + & z & = & 48 \\ & & 3y & + & 3z & = & 24 \\ & & -8y & + & 2z & = & -84 \end{array}$$

$$\begin{array}{l} \text{iii.} \end{array} \quad \begin{array}{rrcrcl} x & + & y & + & z & = & 48 \\ & & 3y & + & 3z & = & 24 \\ & & & & 10z & = & -20 \end{array}$$

- (b) Use back–substitution to solve for x , y , and z . Show all work.
- (c) Finally, check the solution on the answer key (Ask Dr. O’Brien). If you got anything wrong, write a sentence explaining what you did wrong.

For questions (2-4)

- i. Use Gaussian elimination to convert the system to row-echelon form.
- ii. Use back substitution to solve for x , y , and z .
- iii. Finally, check your answer on the answer key (Ask Dr. O'Brien). If you got the wrong answer, write a sentence explaining what you did wrong.

2.

$$\begin{array}{rrrrrr} x & + & y & - & z & = & -2 \\ 2x & - & y & + & z & = & 5 \\ -x & + & 2y & + & 2z & = & 1 \end{array}$$

3.

$$\begin{array}{rrrrrr} 2x & + & 4y & - & 2z & = & 2 \\ 4x & + & 9y & - & 3z & = & 8 \\ -2x & - & 3y & + & 7z & = & 10 \end{array}$$

4.

$$\begin{array}{rrrrrr} x & + & y & - & 3z & = & -1 \\ & & y & - & z & = & 0 \\ -x & + & 2y & & & = & 1 \end{array}$$

5. Are the two systems below equivalent? Be sure to explain in a complete sentence, providing reasons for your answer:

(a)

$$\begin{array}{rrrrrr} x & + & 3y & - & z & = & 6 \\ 2x & - & y & + & 2z & = & 1 \\ 3x & + & 2y & - & z & = & 2 \end{array}$$

(b)

$$\begin{array}{rrrrrr} x & + & 3y & - & z & = & 6 \\ & & -7y & + & 4z & = & 11 \\ & & -7y & - & 4z & = & -16 \end{array}$$