

2024 Fall Math 140 Week-In-Review

Week 3: Sections 2.3-2.4

Section 2.3 and 2.4: Systems of Two Equations in Two Unknowns and Setting Up and Solving Systems of Linear Equations

Some Key Words and Terms: Number and Types of Solutions to Systems, Independent System, Inconsistent System, Dependent System, Solving with Substitution, Solving with the Addition/Elimination Method, Solving with Matrices, Augmented Matrix, Reduced Row Echelon Form Matrix, Parametric Solution, Break-Even Point, Equilibrium Point

Solutions to Systems:

Independent System:

Inconsistent System:

Dependent System:

Parametric Solution:

Solving Systems:

Solving with Substitution:

Solving with Addition/Elimination:

Solving with Matrices:

Augmented Matrix:

Reduced Row Echelon Form:

Break-Even Point:

Equilibrium Point:

Examples:

1. For the system of linear equations shown below, determine the type of system and the number of solutions. Do not solve the system.

$$\begin{aligned}5y + 20 &= 3x \\21x - 147 &= 35y\end{aligned}$$

2. Solve the given system of equations using the Substitution Method.

$$\begin{aligned}2x + 5y &= 8 \\ -3x + 6 &= 3y\end{aligned}$$

3. Solve the given system of equations using the Addition/Elimination Method.

$$\begin{aligned}8y + 12 &= 4x \\ \frac{1}{2}x &= y + \frac{3}{2}\end{aligned}$$

4. Solve the given system of equations using Matrices.

$$\begin{aligned}1.25y + 3 &= 0.5x \\ 4x &= 7 + 10y\end{aligned}$$

5. Solve the given system of equations using Matrices.

$$\begin{aligned}20x + 8z - 22 &= -6y \\ -1.5y - 2z &= 5x - 5.5 \\ 9z &= 11x - 4\end{aligned}$$

6. A new company produces a rare product: "Ultima Vitamins". The function for the total production cost per day is $C(x) = 110x + 55,860$ where x represents the quantity of bottles of Ultima Vitamins and C is measured in dollars. The company sells each bottle of vitamins for 355 each. Determine the daily break-even point for Omega Elixir for the company and interpret it in the context of the scenario.
7. The linear demand equation for a particular vehicle, the City Cruiser, in a large city, Suburbia, is given by $D(x) = p(x) = -250x + 70000$. The linear supply equation for the same vehicle in the same city is given by $S(x) = p(x) = 165x + 2355$. Determine the equilibrium point for City Cruisers in Suburbia and interpret the equilibrium point in the context of the scenario.

8. For the following scenario, setup and do not solve a system of linear equations, including defining variable.

Last year, you decided to invest a total of \$65,000 in two different products: Epsilon and Gamma. The percent return on Epsilon was determined to be 8% and the percent return on Gamma was 13%. You made a total return on your investment of \$7,100. How much did the you invest in each product last year?

9. For the following scenario, setup and do not solve a system of linear equations, including defining variable.

A company makes and sells 3 types of fans: Light-Breeze, Brisk-Draft, and Roaring-Gale. To make each Light-Breeze, it takes 2 units of electronics, 2 units of gears, and 3 units of plastic. To make each Brisk-Draft, it takes 3 units of electronics, 4 units of gears, and 3 units of plastic. To make each Roaring-Gale it takes 5 units of electronics, 5 units of gears, and 4 units of plastic. Each week, the company uses 935 units of electronics, 1055 units of gears, and 960 units of plastic. How many of each fan does the company make each week?

10. The following augmented matrix shows the solution to a system of linear equations for a company that makes 3 types of plant fertilizer and is determining how much Nitrogen, Phosphorus, and Potassium to order. For this system, x represents the amount of Nitrogen, y represents the amount of Phosphorus, and z represents the amount of Potassium, in pounds. State the solution in the context of the scenario.

$$\left[\begin{array}{ccc|c} 1 & 0 & \frac{3}{2} & 108 \\ 0 & 1 & \frac{2}{5} & 80 \\ 0 & 0 & 0 & 0 \end{array} \right]$$

11. For the situation above, are there any values of the parameter that should be excluded?

Exam 1: Covers sections 1.1, 1.2, 2.1, 2.2, 2.3, and 2.4

Minimum Skills:

Recommendations: