

Sections 3.1 & 3.2 – Systems of Linear Equations

In class work: Complete all statements. Solve all exercises.

1. Give an examples of a system of two linear equations in two variables.
2. What is a solution of a system of equations?
3. What does it mean to solve a system?
4. What is the geometric meaning of a solution of a system of two linear equations with two variables (2×2 linear system).
5. How many solutions can a 2×2 linear system have?
6. What methods could be used to solve a 2×2 linear system?
7. Solve the system in (1) algebraically (specify the method used) and graphically.

Exercise 1 Determine whether the systems below are inconsistent, dependent, or consistent and independent.

$$\begin{array}{l} \text{a) } \begin{cases} 2x = y + 4 \\ 8x - 4y = 8 \end{cases} \\ \text{b) } \begin{cases} -3x = 4y + 12 \\ \frac{1}{2}x + 2 = -\frac{2}{3}y \end{cases} \\ \text{c) } \begin{cases} 2u + v = 5 \\ u - 2v = 3 \end{cases} \end{array}$$

Exercise 2 (#74,78,80/3.1) Solve each system by the method of your choice. Write the answer using set notation.

$$\begin{array}{l} \text{a) } \begin{cases} 5x + 2y = -5 \\ 4(x + y) = 6(2 - x) \end{cases} \\ \text{b) } \begin{cases} 2x - y - 5 = 0 \\ 10 = 4x - 2y \end{cases} \\ \text{c) } \begin{cases} 4x - 24 = 3y \\ 9y = 3x - 1 \end{cases} \end{array}$$

(A: $\left(\frac{71}{9}, \frac{68}{27}\right)$ for c)

Exercise 3 (#66/3.1) Solve the system algebraically and graphically.

$$\begin{cases} \frac{1}{16}x - \frac{3}{4}y = -1 \\ \frac{3}{4}x + \frac{5}{2}y = 11 \end{cases} \quad (\text{A: } (8, 2))$$

Exercise 4 In 1984, there were 72 meals per person at take-out restaurants. For the next ten years, this number increased by an average of 2.25 meals per person per year. IN 1984, there were 94 meals per person at on-premise dining facilities and this number decreased by an average of 0.55 meals per person per year.

- Write a function that models the average number of meals per person at take-out restaurants x years after 1984.
- Write a function that models the average number of meals per person at on-premise dining facilities x years after 1984.
- In which year, to the nearest whole year, was the average number pf meals per person for take-out and on-premise restaurants the same? For that year, how many meals per person, to the nearest whole number, were there for each kind of restaurant? Which kind of restaurant had the greater number of meals per person after that year?
(A: 1992; 90 meals per person)

Exercise 5 (#88/3.1) For the linear function $f(x) = mx + b$, $f(-3) = 23$ and $f(2) = -7$.

Find m and b . (A: $m = -6, b = 5$)

Exercise 6 (#11/3.2) One week a computer store sold a total of 36 computers and external hard drives. The revenue from these sales was \$27,710. If computers sold for \$1180 per unit and hard drives for \$125 per unit, how many of each did the store sell? (A: 22 and 14)

Exercise 7 (#14/3.2) You invested \$11,000 in stocks and bonds, paying 5% and 8% annual interest. If the total interest earned for the year was \$730, how much was invested in stocks and how much was invested in bonds? (A: \$5000 and \$6000)

Exercise 8 You invested \$30,000, part of it in a stock that paid 14% annual interest. The rest of the money suffered a 6% loss. If the total annual income from both investments was \$200, how much was invested at each rate? (A: 10,000, 20,000)

Exercise 9 (#20/3.2) A jeweler needs to mix an alloy with a 16% gold content and an alloy with a 28% gold content to obtain 32 ounces of a new alloy with a 25% gold content. How many ounces of each of the original alloys must be used? (A: 8 and 24)

Exercise 10 (#28/3.2) When a plane flies with the wind, it can travel 4200 miles in 6 hours. When the plane flies in opposite direction, against the wind, it takes 7 hours to fly the same distance. Find the rate of the plane in still air and the rate of the wind. (A: 650, 50)

Exercise 11 (#37/3.2) A rectangular lot whose perimeter is 220 feet is fenced along three sides. An expensive fencing along the lot's length costs \$20 per foot, and an inexpensive fencing along the two side widths costs only \$8 per foot. The total cost of the fencing along the three sides comes to \$2040. What are the lot's dimensions? (A: 70ft by 40ft)

Exercise 12 (#48/3.2) A company that manufactures bicycles has a fixed cost of \$100,000. It cost \$100 to produce each bicycle. The selling price is \$300 per bike.

- Write the cost function.
- Write the revenue function.
- Determine the break-even point

(A: (500,150,000))