

Linear Systems: Solving by Graphing

Date Lesson Notes

Linear System

- A set of two or more linear equations that are considered at the same time

Example: $y = 4x + 1$

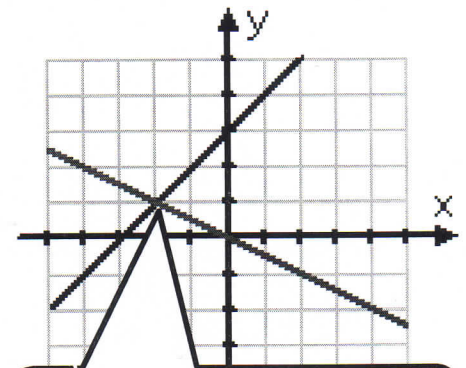
$y = 2x - 8$

Point of intersection

- The point at which two lines cross on a graph
- The coordinates of the point of intersection (x, y) satisfies BOTH equations

Key Concepts:

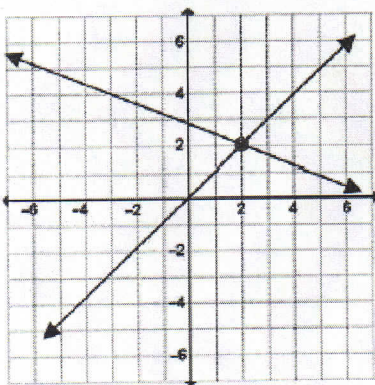
- The solution to a linear system is the point of intersection (POI) of the lines.
- A linear system can be solved by graphing the lines, then reading the P.O.I. (x, y) from the graph
- To check the solution to a linear system, substitute the coordinates of the point of intersection into the original equations



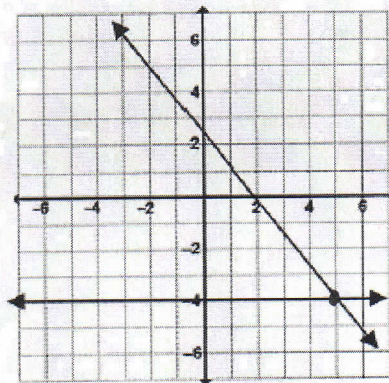
This is the point of intersection. The solution to the linear system is the coordinates (x, y) of the intersection.

EXAMPLES:

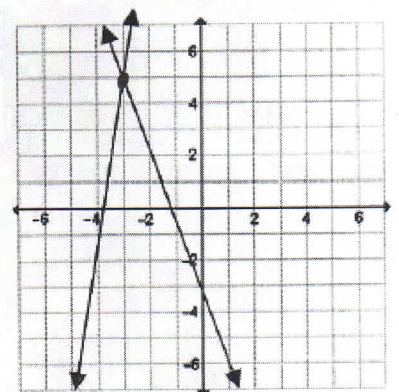
State the solution the (P.O.I) for each of the following graphs:



POI: (2, 2)



POI: (5, -4)



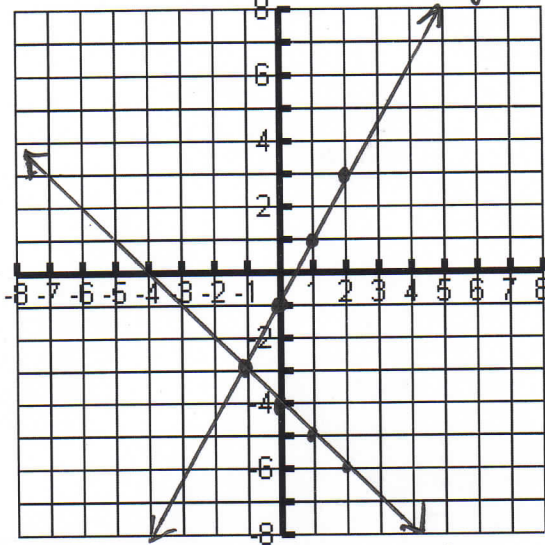
POI: (-3, 5)

Linear Systems: Solving by Graphing

Date Solution 5

Examples: Find the point of intersection (the solution) by graphing the following:

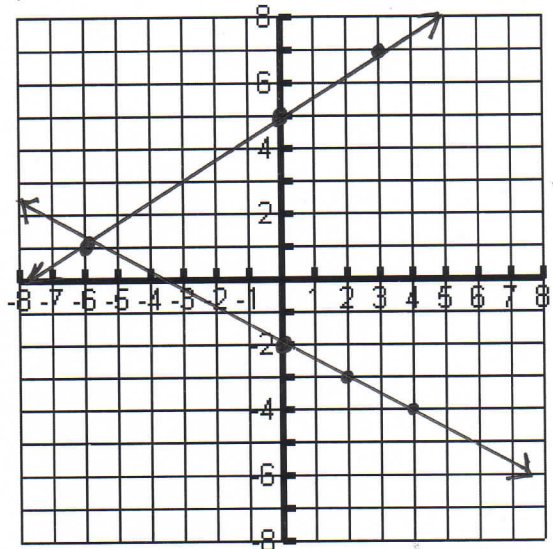
a) $y = 2x - 1$ ① $y + x = -4$ ② $y = -x - 4$



The point of intersection is $(-1, -3)$

Check: (1) LS RS (2) LS RS
 $= y = 2x - 1$ $= y = -x - 4$
 $= -3 = 2(-1) - 1$ $= -3 = -(-1) - 4$
 $= -3 = -2 - 1$ $= -3 = 1 - 4$
 $= -3 = -3$ $= -3 = -3$

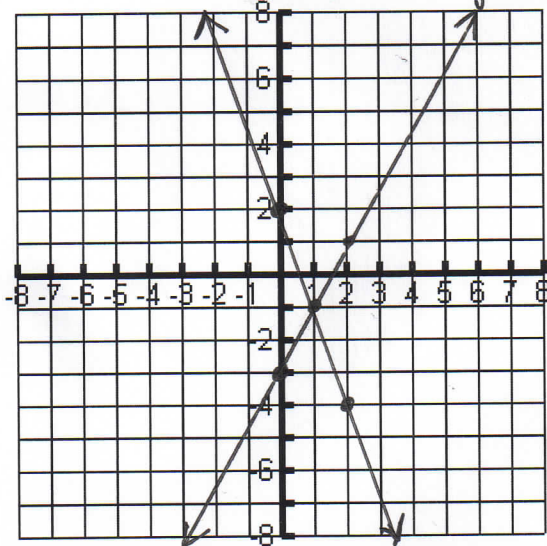
b) $y = \frac{2}{3}x + 5$ ① $y = -\frac{1}{2}x - 2$ ②



The point of intersection is $(-6, 1)$

Check: (1) LS RS (2) LS RS
 $= y = \frac{2}{3}x + 5$ $= y = -\frac{1}{2}x - 2$
 $= 1 = \frac{2}{3}(-6) + 5$ $= 1 = -\frac{1}{2}(-6) - 2$
 $= 1 = -\frac{12}{3} + 5$ $= 1 = \frac{6}{2} - 2$
 $= 1 = -4 + 5 = 1$ $= 1 = 3 - 2 = 1$

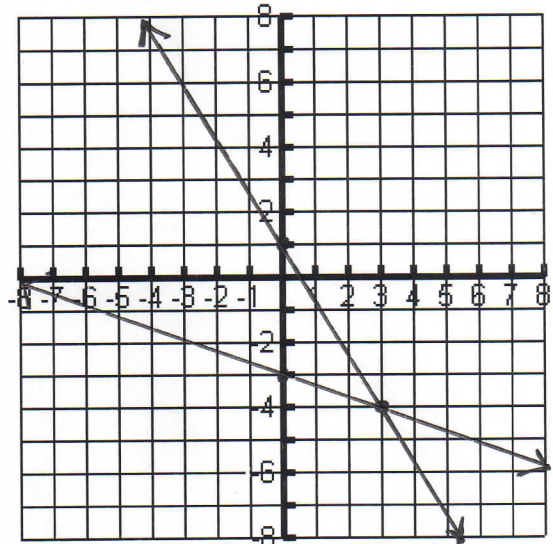
c) $y = 2x - 3$ ① $3x + y = 2$ ② $y = -3x + 2$



The point of intersection is $(1, -1)$

Check: (1) LS RS (2) LS RS
 $= y = 2x - 3$ $= y = -3x + 2$
 $= -1 = 2(1) - 3$ $= -1 = -3(1) + 2$
 $= -1 = 2 - 3$ $= -1 = -3 + 2$
 $= -1 = -1$ $= -1 = -1$

d) $y = \frac{-5}{3}x + 1$ ① $y = \frac{-1}{3}x - 3$ ②



The point of intersection is $(3, -4)$

Check: (1) LS RS (2) LS RS
 $= y = \frac{-5}{3}x + 1$ $= y = \frac{-1}{3}x - 3$
 $= -4 = \frac{-5}{3}(3) + 1$ $= -4 = \frac{-1}{3}(3) - 3$
 $= -4 = \frac{-15}{3} + 1$ $= -4 = \frac{-1}{3}(3) - 3$
 $= -4 = -5 + 1$ $= -4 = -1 - 3$
 $= -4 = -4$ $= -4 = -4$

Linear Systems: Solving by Graphing Word Problems

Date Solutions

Example 1: Two online music providers are offering special memberships. Citrus Wire charges a monthly fee of \$20 plus \$1.00 for each song. Ear Bud charges a \$10 monthly fee plus \$2.00 per song. Let n represent the number of songs and C represents the total cost for the month.

Citrus Wire: $C = n + 20$
(represented by solid line)

Ear Bud: $C = 2n + 10$
(represented by dashed line)

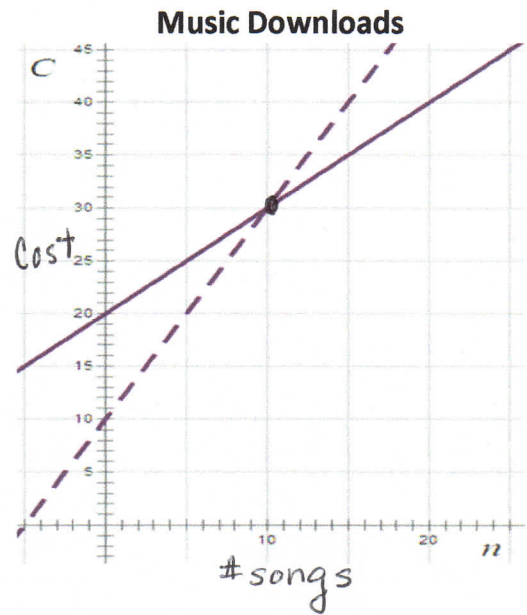
a) Point of Intersection (P.O.I.): (10, 30)

b) Interpretation of the point: When you buy 10 songs, the cost is the same (\$30) for both music providers.

c) If you download less than 10 songs, choose Ear Bud.

If you download more than 10 songs, choose Citrus Wire.

If you download 10 songs, choose either company and the cost is \$30 (the same)



Example 2: Ari has been offered two different jobs. Khaki Barn pays \$125 per month plus 5% commission of his total monthly sales. Luv My Home pays \$100 per month plus 10% commission of his total monthly sales. Let s be the total sales for the month and E be the total earnings for the month.

Khaki Barn: $E = 125 + 0.05s$
(represented by solid line)

Luv My Home: $E = 100 + 0.10s$
(represented by dashed line)

a) Point of Intersection (P.O.I.): (500, 150)

b) Interpretation of the Point: When sales are \$500, earnings are the same at both companies.

c) If Ari sells less than \$500 dollars in goods, he should choose Khaki Barn.

If Ari's sales are greater than \$500 dollars, he should choose Luv My Home

If Ari's sales total \$500 dollars, he could choose either job and the earnings are \$150 (the same).

