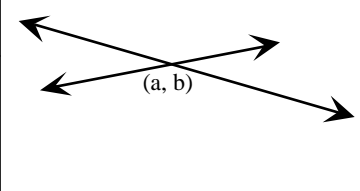
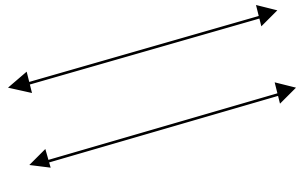
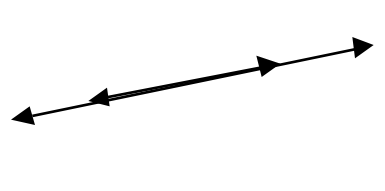


There are 3 possible cases for the solution of a linear system, and there are 3 techniques for solving a system: (1) graphing, (2) substitution, and (3) elimination.

	Case 1	Case 2	Case 3
Drawing			
Geometric relationship	Intersecting lines	Parallel lines	Coinciding lines
Solution	$\{(a, b)\}$	No solution	$\{(x, y): \text{either equation}\}$

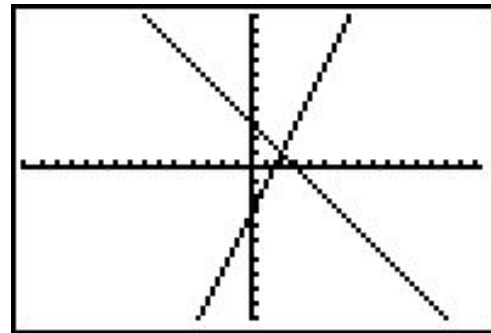
Exercises:

- Determine whether the given ordered pair is or is not the solution to the given linear system:
 $y = -2x$ $x + y = 4$
 (a) $(-2, 4)$ (b) $(-4, 8)$ (c) $(2, 2)$ (d) $(-4, -8)$

- Estimate the solution to the given linear system, then use the two equations to verify your result.

$$y = 2x - 3$$

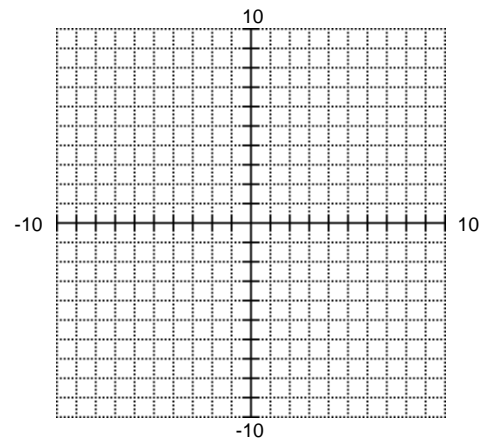
$$x + y = 3$$



- Solve the following linear system with the graphing method. Write the corresponding equation on each line, and clearly label the point of intersection.

$$y = 3x - 3$$

$$y = \frac{1}{2}x + 2$$



Linear Systems and Applications

4. Solve the following linear systems using elimination or substitution. Verify by checking the solution in both equations. You may also use your grapher to confirm.

(a) $5x - 2y = 3$
 $2x + y = 0$

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

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

(d) $3x - 2y = 7$
 $2x + 3y = 5$

(e) $y = x + 2$
 $3x - 3y = -6$

(f) $y = 2x - 5$
 $y = 2x + \frac{5}{3}$

(g) $y = 3x - 1$
 $y = 2x + 3$

(h) $2x - y = 3$
 $5x + 3y = 0$

5. Base Salary and Commission

When Jan started working with a pool supply company, she wanted some consistency in her paycheck, some assurance that she'd be able to pay her bills. Jan negotiated for \$1,200 a month base salary, plus 5% commission on all sales for a month. Her twin brother Jeff works with the same company, but he gets "pure commission" — 7% on all sales for a month. Write an equation for each employee, relating total sales and salary. Complete the chart, and find the sales figure when their monthly salary would be equal.

Total Sales	Jan's Monthly Salary	Jeff's Monthly Salary
\$0		
\$20,000		
\$40,000		
\$60,000		
\$80,000		
\$100,000		
\$120,000		

6. A radio station approached a company with 2 packages for placing ads on its station. The first package contained 5 30-second ads and 10 60-second ads. It costs \$4,500. The second package costs \$4,500, but it contained 12 30-second ads and 6 60-second ads. How much did the different length ads cost individually? (Let x represent the cost of a 30-second ad, and let y represent the cost of a 60-second ad.)

Linear Systems and Applications

7. A truck made two hauls. It hauled contaminated barrels of pesticide and barrels of kerosene. The first load tipped the scales at 8700 pounds and contained 6 barrels of pesticide and 10 barrels of kerosene. The second load contained 9 barrels of each and weighed 8550 pounds. How much did each barrel of pesticide and each barrel of kerosene weigh?
8. A DC-10 travels 3000 km with a tail wind in 3 h 20 min. It makes the return trip against a head wind in 3 h 45 min. Find the speed of the plane in still air and the speed of the wind.
9. A family in one car leaves their home at 9 a.m. toward a vacation spot, traveling at 60 mph. Thirty minutes later, a neighbor friend starts off in another car, heading toward the same place at 70 mph. At what time will the second car overtake the first?
10. The percentages of men and women in the labor force in recent years is shown below. (Source: U.S. Bureau of Labor Statistics)

Year	Percentage of Men in the Labor Force	Percentage of Women in the Labor Force
1985	76.3	54.5
1990	76.4	57.5
1995	75.0	58.9
1997	75.0	59.8

- (a) Find linear regression functions $M(x)$ and $W(x)$ that represent the percentages of men and women in the labor force, respectively.
- (b) Use these functions, and predict when the percentages of men and women in the labor force will be equal.
11. Macadamia nuts cost an astounding \$16.50 per pound, but research by Planter's Peanuts shows that mixed nuts sell better if macadamias are included. The standard mix costs \$9.25 per pound. Find how many pounds of macadamias and how many pounds of the standard mix should be combined to produce 50 pounds that will cost \$10 per pound. Find the amounts to the nearest tenth of a pound.
- *12. Econo-Car rents a subcompact at \$29.95 a day plus 30¢ a mile, with no mileage charge for the first 150 miles. Thrift-Co rents the same type of car at \$34.95 a day plus 25¢ a mile, with the first 200 miles free. Art's Rent-a-Car charges \$49.95 a day, with unlimited free mileage. Write an equation for each rental company, relating mileage (m) and rental charge (C). Solve the various systems (Econo-Car and Thrift-Co, Thrift-Co and Art's Rent-a-Car, and Art's Rent-a-Car and Econo-Car). Then decide which company you'd choose, and under what circumstances. Plot each linear function and the "least cost function" with critical points clearly labeled on the graph.

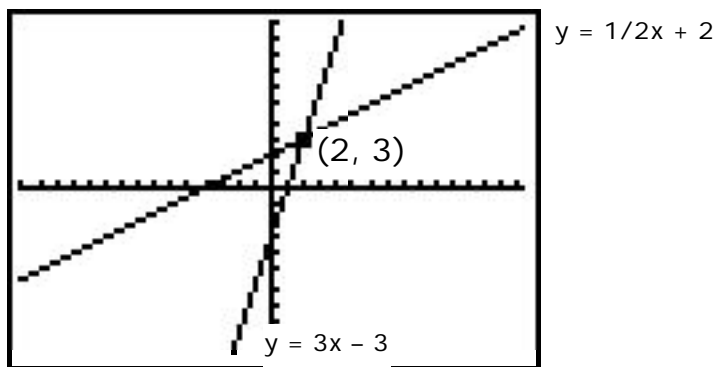
Linear Systems and Applications

13. A cattle producer has 30 heifers within a month of calving. Their average weight is 875 lbs. They should be on a ration containing 8.7% protein. The cattleman wants to place the heifers on corn (9.6% protein) and bahiagrass hay (7.4% protein). If he grinds the hay and mixes it with the corn, how many pounds of each will he need to use if he can mix a total of 2000 lbs of the ration in his mixer?

Odd # solutions:

1. (a) No (b) Yes (c) No (d) No

3.



5. Jan $y = .05x + 1200$; Jeff $y = .07x$
 [Note: In each case, x represents total sales, y represents monthly salary.]

Total Sales	Jan's Monthly Salary	Jeff's Monthly Salary
\$0	\$1,200	\$0
\$20,000	\$2,200	\$1,400
\$40,000	\$3,200	\$2,800
\$60,000	\$4,200	\$4,200
\$80,000	\$5,200	\$5,600
\$100,000	\$6,200	\$7,000
\$120,000	\$7,200	\$8,400

7. Each barrel of pesticide weighed 200 lb, and each barrel of kerosene weighed 750 lb.

9. at 12:30 p.m.

11. 5.2 lb of Macadamia nuts, 44.8 lb of the standard mix

13. 1182 lb of corn, 818 lb of hay