

MA 110 COLLEGE ALGEBRA  
PRACTICE TEST FOUR  
Scens: 6.1, 6.2, 6.5, 6.6, 6.7, 8.1, 8.2, 8.3.

1. Determine whether the given point is in the solution set to the given system. Check graphically. [6.1]

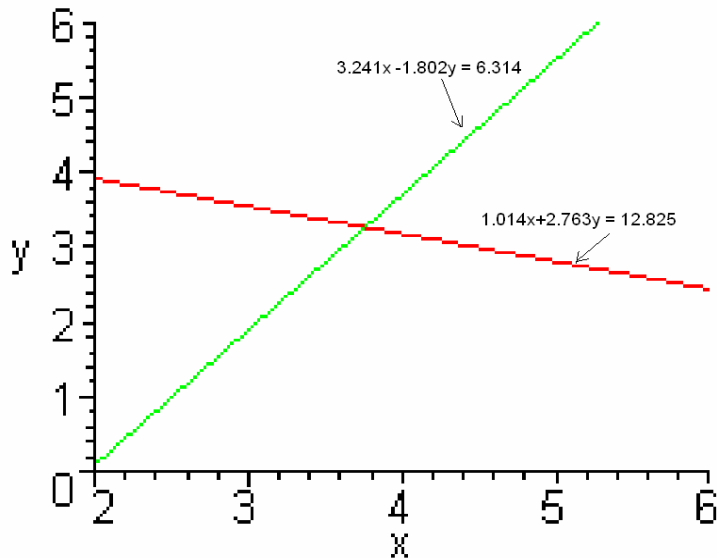
1a) (3, 2)

$$3x - y = 7$$

$$2x + 3y = 12$$



b) Solve the system by inspecting the graph of the equation. [6.1]



2 - 5. Solve using the substitution method. Write solutions as an ordered pair. Use a graphing calculator to check your answer. [6. 1]

2)

$$3x - y = 2$$

$$x - 3y = -10$$

3)  $3x + y = 3$

$$5x + 2y = 5$$

4)

$$\frac{x}{2} + \frac{y}{3} = 3$$

$$\frac{x}{4} - \frac{2y}{3} = -1$$

5)  $0.2x + 0.3y = 0.8$

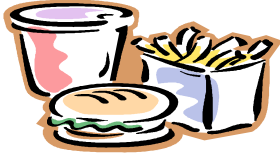
$$0.3x + 0.4y = 1.3$$



6. Receipts. The Star Theatre wants to know whether the majority of its patrons are adults or children. During a week in July 5200 tickets were sold and the receipts totaled \$33,840. The adults' admission is \$8.00 and the children's admission is \$4.00. How many adult patrons were there? [6.1]



7. In preparing a diet for some experimental animals, a biologist determines that the animals need 20 ounces of protein and 6 ounces of fat. She is able to purchase two types of food, one with 20% protein and 2% fat, the other with 10% protein and 6% fat. How many ounces of each food should go into the diet mix?



8. Last week, when Brandon went to a hamburger's place, he paid \$8.80 for 8 hamburgers and 4 orders of fries. The next day, he treated his Little League baseball team to dinner and paid \$27 for 20 hamburgers and 20 orders of fries. How much does one hamburger and one order of fries cost? (There is no sales tax.) [6. 1]

9. Finance. Two investments are made totaling \$50,000. In one year the first investment yields a profit of 10%, whereas the second yields a profit of 12%. Total profit for this year is \$5250. Find the amount initially put into each investment. [6.1]



10-12. Solve using the elimination or addition method. Also determine whether each system is consistent or inconsistent. Use a graphing calculator to check your answers. [6. 1]

10)  $2x - 3y = -7$   
 $3x + y = -5$

11)  $x - 2y = 3$   
 $-2x + 4y = 1$

12)  $2x - y = 1$   
 $4x - 2y = 2$



13-15. Determine whether the given point is in the solution set to the given system. [6. 2]

13) (1,3,2)

$$\begin{aligned}x + y - 2z &= -1 \\4x - y + 3z &= 3 \\3x + 2y - z &= 4\end{aligned}$$

$$14) (-2, 1, 3)$$

$$\frac{1}{2}x + y + z = 3$$

$$x - 2y - \frac{1}{3}z = -5$$

$$\frac{1}{2}x - 3y - \frac{2}{3}z = -6$$

$$15) (5a-2, 4a-3, a)$$

$$\mathbf{x - y - z = 1}$$

$$\mathbf{-x + 2y - 3z = -4}$$

$$\mathbf{3x - 2y - 7z = 0}$$



16. A recreation center wants to purchase albums to be used in the center. There is no requirement as to the artists. The only requirement is that they purchase 40 rock albums, 32 western albums, and 14 blues albums. There are different shipping packages offered by the record company. They are an assorted carton, containing 2 rock albums, 4 western albums, and 1 blues album; a mixed carton containing 4 rock and 2 western albums; and a single carton containing 2 blues albums. What combination of these packages is needed to fill the center's order? [6.2]



17. **Curve Fitting** Find the equation of the parabola with vertical axis that passes through the data points specified. Then support your answer with a graph. [6.2]

$$(2,9), (-2,1), (-3,4)$$

18. Solve using elimination or substitution. [6.2]

$$2x + 6y - z = 6$$

$$4x - 3y + 5z = -5$$

$$6x + 9y - 2z = 11$$

19. Write the system of equations that corresponds to the following augmented matrix. [6.5]

$$\left[ \begin{array}{ccc|c} 1 & 3 & 0 & 9 \\ 0 & -1 & 4 & -2 \\ 1 & 0 & -5 & 0 \end{array} \right]$$

20- 23. Perform the row operations indicated on the following matrix: [6.5]

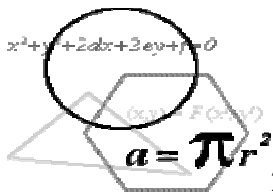
$$\left[ \begin{array}{cc|c} 1 & -3 & 2 \\ 4 & -6 & -8 \end{array} \right]$$

20)  $R_1 \leftrightarrow R_2$

21)  $-4R_1 \rightarrow R_1$

22)  $2R_2 \rightarrow R_2$

23)  $-2R_1 + R_2 \rightarrow R_2$



24. Application: Solve the system of equation using any method. If the system has no solution, say that it is inconsistent. [6.5]

$$2x + y - z + 2w = -6$$

$$3x + 4y + w = 1$$

$$x + 5y + 2z + 6w = -3$$

$$5x + 2y - z - w = 3$$



25. **Nutrition** A dietician at Palos Community Hospital wishes a patient to have a meal that has 78 grams of protein, 59 grams of carbohydrates, and 75 milligrams of vitamin A. The hospital food service tells the dietitian that the dinner for today is salmon steak, baked eggs, and acorn squash. Each serving of salmon steak has 30 grams of protein, 20 grams of carbohydrates, and 2 milligrams of vitamin A. Each serving of baked eggs contains 15 grams of protein, 2 grams of carbohydrates, and 20 milligrams of vitamin A. Each serving of acorn squash contains 3 grams of protein, 25 grams of carbohydrates, and 32 milligrams of vitamin A. How many servings of each food should the dietitian provide for the patient? [6. 5]

26. Find a, b, and c such that the graph of

$$y = ax^2 + b\sqrt{x} + c$$

goes through the points (0,3), (1,-1/2), and (4,3). [6. 5]

27. Given matrix shown here, the diagonal entries are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

$$\begin{bmatrix} 1 & 0 & 4 \\ 1 & 3 & -7 \\ 5 & -1 & 2 \end{bmatrix}$$

28. For the following exercise, let

$$A = \begin{bmatrix} 2 & -3 & 4 \\ 0 & 2 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & -2 & 0 \\ 5 & 1 & 2 \end{bmatrix}$$

$$C = \begin{bmatrix} -3 & 0 & 5 \\ 2 & 1 & 3 \end{bmatrix}$$

Find each of the following. Use a calculator to check your answer. [6. 6]

a)  $2A - 3C$

b)  $A + B$

c)  $BA$

d)  $B - A$

e)  $A^3$

f)  $AB$

29. Compute each product. Verify your solution using a graphing utility. [6. 6]

a)

$$\begin{bmatrix} 1 & -2 & 3 \end{bmatrix} \begin{bmatrix} 0 & 1 \\ 1 & 2 \\ 2 & 3 \end{bmatrix}$$

b)

$$\begin{bmatrix} 2 & 0 \\ 4 & -2 \\ 6 & -1 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ 3 & -2 \end{bmatrix}$$

c)

$$\begin{bmatrix} 1 & -2 & 3 \\ 4 & 0 & 6 \end{bmatrix} \begin{bmatrix} -1 & 2 & 1 \\ 1 & 3 & 0 \\ 0 & 4 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & 0 \\ -1 & 3 & 4 \\ 0 & 4 & 3 \end{bmatrix} \begin{bmatrix} 7/4 & 3/4 & -1 \\ -3/4 & -3/4 & 1 \\ 1 & 1 & -1 \end{bmatrix}$$

d)

30. Use a calculator to find  $A^{-1}$ , if it exists. [6.7]

$$A = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 1 & -1 & 1 \\ 1 & -1 & 1 & 1 \\ 0 & 1 & 0 & -1 \end{bmatrix}$$



31. Solve each system of equations using the inverse of the coefficient matrix of the equivalent matrix equations. [6. 7]

$$\begin{aligned} x + y + z &= 3 \\ 3x + y &= -4 \\ 2x + 3y + 4z &= 6 \end{aligned}$$

32. Determine whether the following matrices are inverses of each other. [6. 7]

$$\begin{bmatrix} 1 & 1 & 0 \\ -1 & 3 & 4 \\ 0 & 4 & 3 \end{bmatrix} \begin{bmatrix} 7/4 & 3/4 & -1 \\ -3/4 & -3/4 & 1 \\ 1 & 1 & -1 \end{bmatrix}$$

33. Use a calculator to find  $A^{-1} = B$ , and then confirm the inverse by showing

$$AB = BA = 1_{[6, 7]}$$

$$\begin{bmatrix} 7/4 & 3/4 & -1 \\ -3/4 & -3/4 & 1 \\ 1 & 1 & -1 \end{bmatrix}$$

34. Write the first five terms of each sequence. Verify your results by using a graphing utility. [8.1, 8.2]

a)  $a_n = \{1 + (-1)^{(n+1)}\}$

b)  $a_n = \{(-1)^{(n+1)} \left(\frac{1}{2}\right)^n\}$

c)  $a_n = \left\{\frac{(-1)^n}{3n-4}\right\}$

35. Find and evaluate each sum. Verify your results using a graphing utility. [8.1, 8.2]

a)  $\sum_{k=0}^4 \frac{(-1)^k}{k+1}$

b)  $\sum_{i=1}^4 ((i-1)^2 + (i+1)^3)$



36-38. *Applications:* Find the eighth term of the sequence that has a first term of -2 and a common difference of 4. [8.1, 8.2]

37. Find the following. [8.1, 8.2]

- a) Find the 31<sup>st</sup> term; when  $d = 5$ , and the first term is 12.
- b) Find the 28<sup>th</sup> term; when  $d = 7$ , and the 1st term is 4.
- c) Find  $d$ ; when the 2nd term is 9, and the 14th term is 3.
- d) If an arithmetic series has the 1st term as  $-9$ , and the 40<sup>th</sup> term as 147 what is the sum at 62?

38. The common difference in an arithmetic sequence is 3. The 10<sup>th</sup> term is 23. Find the first term. [8.1, 8.2]

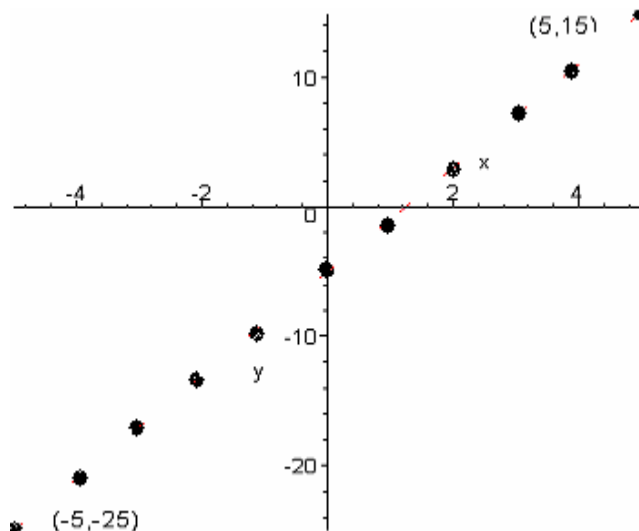
In Problems 39- 41, find the sum of each arithmetic sequence. [8.1, 8.2]

39.  $1 + 3 + 5 + \dots + (2n-1)$

40.  $7 + 12 + 17 + \dots + (2+5n)$

41.  $5 + 9 + 13 + \dots + 49$

42. *Application:* Find a formula for the  $n$ th term of the arithmetic sequence shown in the following graph. Then state the domain and range of the sequence. [8.1, 8.2]



43) A geometric sequence is given. Find the common ratio and write out the first four terms. [8.3]

a)  $A_n = \left(\frac{-1}{2}\right)^{n-1}$

b)  $A_n = -64\left(\frac{-1}{4}\right)^{n-1}$

44a) Find the 1<sup>st</sup> term; when the 6<sup>th</sup> term is 36 and the ratio is -6.

b) Find the ratio; when the 2<sup>nd</sup> term is -4 and the 6<sup>th</sup> term is -81/4.

c) Find the 13<sup>th</sup> term; when the 5<sup>th</sup> term is 8/27 and the 8<sup>th</sup> term is -1. [8.3]

45-50. Find the sum of the geometric series. [8.3]

45)  $8 + 6 + 9/2 + 27/8 + \dots$

46)  $4 - 2 + 1 - 1/2 + \dots$

47.  $\sum_{i=1}^5 \left(5 \frac{1}{3^{(i+1)}}\right)$

48.  $\sum_{i=0}^{10} \left(10 \left(\frac{-1}{2}\right)^i\right)$

49.  $\sum_{i=1}^{10} (5 (-2)^{(i-1)})$

50.  $\sum_{i=0}^8 \left(\frac{1}{2}\right)^i$

51. The 4<sup>th</sup> term of a geometric sequence is 125, and the 10<sup>th</sup> term is 125/64. Find the 14<sup>th</sup> term. [11.3]

52-53. Find the sum of each infinite geometric sequence. [8.3]

52.  $2 + 4/3 + 8/9 + \dots$

53.  $2 - 1/2 + 1/8 - 1/32 + \dots$

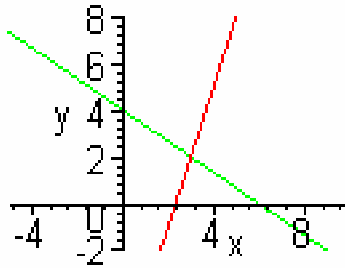
54. Find the fifth term and the  $n$ th term of the geometric sequence whose initial term  $a_1$  and common ratio  $r$  is given. [8.3]

$$a_1 = 3 \text{ and } r = -2/3$$

55. An automobile that costs \$16,000 when new depreciates 50% in value each year.

What is the worth at the end of five years? [11.3]

Answers:



1a) Yes, solution

b) Ans: (3.761, 3.261)

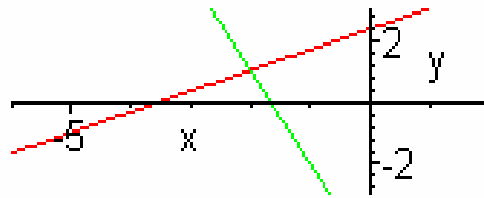
2) **Ans: (2, 4)**

3) **Ans: (1, 0)** 4) **Ans: (4, 3)** 5) **Ans: (7, -2)**

6) 3260 adults 7) 60 ounces of protein & 80 ounces of fat.

8) One hamburger costs \$0.85 and an order of fries costs \$0.50.

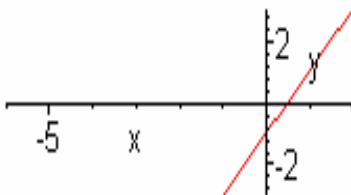
9) \$37,500 in the first (10%) investment; \$12,500 in the second (12%) investment.



10) The solution is (-2, 1) and it is consistent.

11) Because there are no values of  $x$  and  $y$  for which  $0=7$ , the system is inconsistent and has no solution, the two lines are parallel and has no point of intersection.

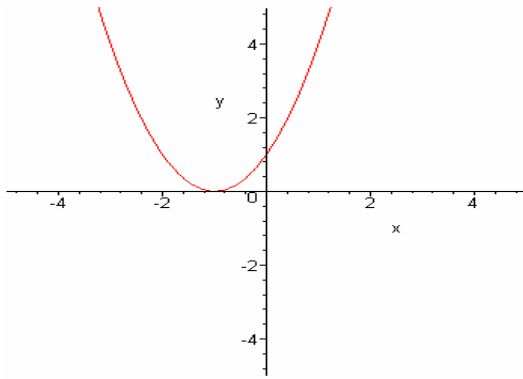
12) Because the two equations turn out to be equivalent for which  $0=0$  (have the same solution set), the system has infinitely many solutions. The system is consistent.



13) No 14) Yes 15) Yes

16) 4 assorted cartons, 8 mixed cartons, 5 single cartons.

17)  $f(x) := x^2 + 2x + 1$



18)  $\left(\frac{1}{2}, \frac{2}{3}, -1\right)$

19.  $x + 3y = 9$

$-y + 4z = -2$

$x - 5z = 0$

20).  $\left[ \begin{array}{cc|c} 4 & -6 & -8 \\ 1 & -3 & 2 \end{array} \right]$

21)  $\left[ \begin{array}{cc|c} -4 & 12 & -8 \\ 4 & -6 & -8 \end{array} \right]$

22)  $\left[ \begin{array}{cc|c} 1 & -3 & 2 \\ 8 & -12 & -16 \end{array} \right]$

23)  $\left[ \begin{array}{cc|c} 1 & -3 & 2 \\ 2 & 0 & -12 \end{array} \right]$

24) Ans: (1,0,4,-2)

25) 1.5 salmon steak, 2 baked eggs, 1 acorn squash.

$y = 0.5x^2 - 4\sqrt{x} + 3$

26)

27) 1, 3, and 2

a)  $\left[ \begin{array}{ccc} 13 & -6 & -7 \\ -6 & 1 & -7 \end{array} \right]$

b)  $\left[ \begin{array}{ccc} 3 & -5 & 4 \\ 5 & 3 & 3 \end{array} \right]$

c) No solution

d)  $\left[ \begin{array}{ccc} -1 & 1 & -4 \\ 5 & -1 & 1 \end{array} \right]$

28)

e) Undefined f) No solution

29. a)  $\begin{bmatrix} 4 & 6 \end{bmatrix}$     b)  $\begin{bmatrix} 4 & 2 \\ 2 & 8 \\ 9 & 8 \end{bmatrix}$     c)  $\begin{bmatrix} -3 & 8 & 4 \\ -4 & 32 & 10 \end{bmatrix}$     d)  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

30. Ans:  $A^{-1} = \begin{bmatrix} 2 & -1 & -1 & -2 \\ -1 & 1 & 1 & 2 \\ -2 & 1 & 2 & 3 \\ -1 & 1 & 1 & 1 \end{bmatrix}$     31. Ans:  $x=14/9$   
 $y=26/3$   
 $z=65/9$

$$\begin{bmatrix} 1 & 1 & 0 \\ -1 & 3 & 4 \\ 0 & 4 & 3 \end{bmatrix}$$

32. Yes. 33.

34a) 2, 0, 2, 0, 2.    b)  $\frac{1}{2}, -\frac{1}{4}, \frac{1}{8}, -\frac{1}{16}$ ,

$\frac{1}{32}$ .    c) 1, 0.5 or  $\frac{1}{2}$ , -0.2 or  $-\frac{1}{5}$ , 0.125 or  $\frac{1}{8}$

$\frac{1}{8}$ , -0.090909 or  $-\frac{1}{11}$ .

35a)  $\frac{47}{60}$ ;    b) 238

36)  $a_8 = -6 + 4(7) = 22$

37a)  $a_{31} = 162$ ;    b)  $a_{28} = 193$ ;    c)  $d = -1/2$ ;    d)  $S_{62} = 7006$ .

38)  $a_1 = -4$     39)  $n^2$     40)  $\frac{n}{2}(9 + 5n)$     41) 324

42.  $A_n = 4n - 5$ : D:  $\{-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5\}$ ;

R:  $\{-25, -21, -17, -13, -9, -5, -1, 3, 7, 11, 15\}$

43a) Common ratio =  $-1/2$ ; First four terms are: 1,  $-1/2$ ,  $1/4$ ,  $-1/8$ .

b) Common ratio =  $-1/4$ ; First four terms are: -64, 16, -4, 1.

44a) The first term is  $-1/216$ ; b)  $r = \pm 3/2$ ; c) the 13<sup>th</sup> term is  $243/32$ .

45)  $8 + 6 + 9/2 + 27/8 + \dots$  Answer: 32

46)  $4 - 2 + 1 - 1/2 + \dots$  Answer:  $8/3$ . 47)  $605/729$ ; 48) 6.670;

49)  $-1705$ ;

50)  $511/256$ .

51) The 14<sup>th</sup> term is  $125/1024$ . 52) 6

53)  $8/5$  54) 5th term =  $16/27$ ;  $a_n = 3\left(\frac{-2}{3}\right)^{n-1}$  55) \$500.00