

p.1 Solutions

$$\begin{array}{r}
 1. \quad 4x + 5y = -9 \\
 5(8x - y = -7)
 \end{array}
 =
 \begin{array}{r}
 4x + 5y = -9 \\
 \underline{40x - 5y = -35} \\
 44x = -44 \\
 x = -1
 \end{array}$$

$$4(-1) + 5y = -9$$

$$-4 + 5y = -9$$

$$5y = -5$$

$$y = -1$$

$$\boxed{(-1, -1)}$$

$$\begin{array}{r}
 2. \quad 2(-x + y = -14) \\
 -3x - 2y = -2
 \end{array}
 =
 \begin{array}{r}
 -2x + 2y = -28 \\
 \underline{-3x - 2y = -2} \\
 -5x = -30 \\
 x = 6
 \end{array}
 \quad
 \begin{array}{r}
 -6 + y = -14 \\
 y = -8
 \end{array}$$

$$\boxed{(6, -8)}$$

$$\begin{array}{r}
 3. \quad (-9x - 6y = 27) 5 \\
 (8x + 5y = -23) 6
 \end{array}
 =
 \begin{array}{r}
 -45x - 30y = 135 \\
 \underline{48x + 30y = -138} \\
 3x = -3
 \end{array}$$

$$-9(-1) - 6y = 27$$

$$9 - 6y = 27$$

$$-6y = 18$$

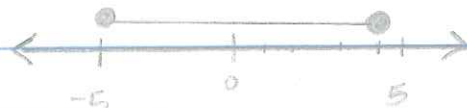
$$y = -3$$

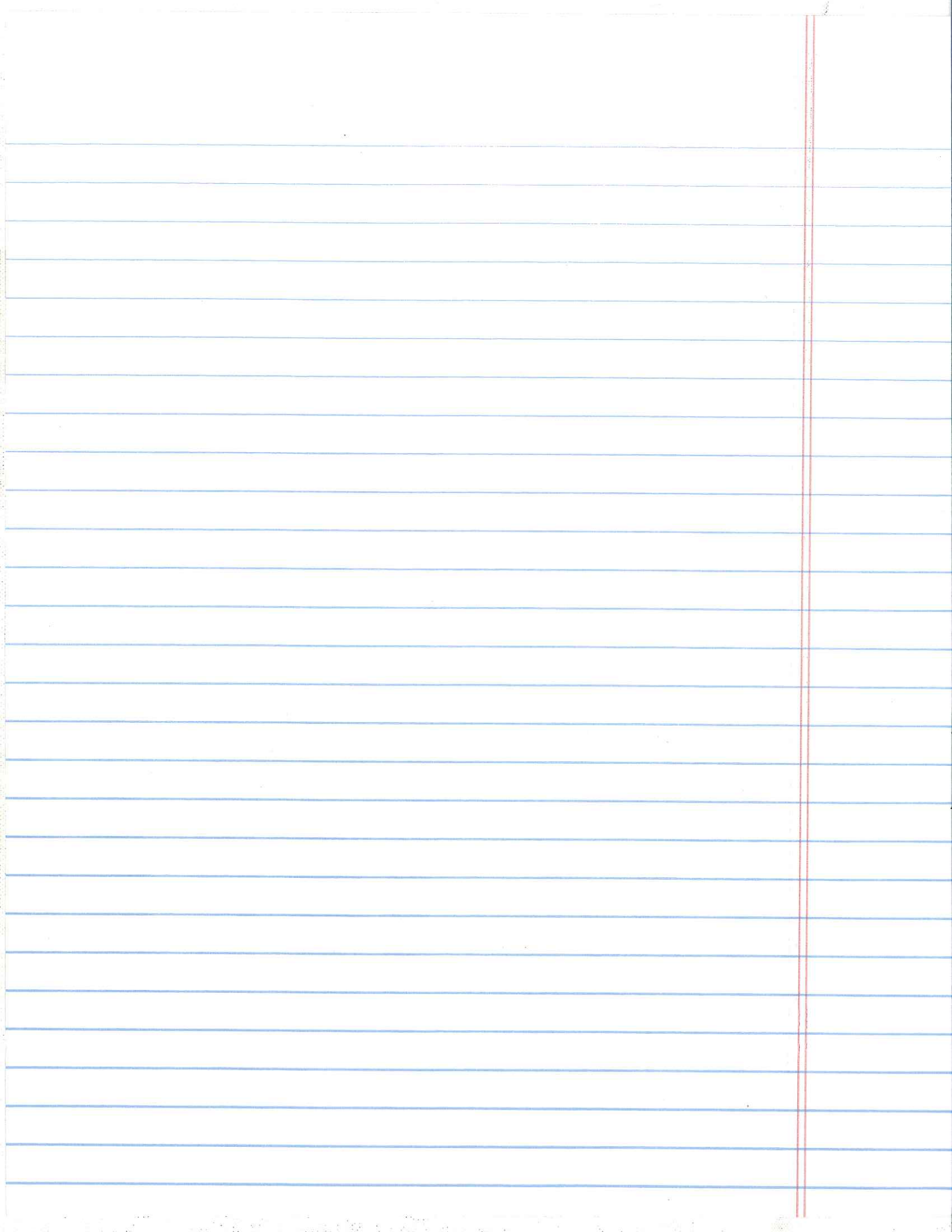
$$\boxed{(-1, -3)}$$

$$4. \quad \frac{-14}{+2} \leq \frac{-2-3n}{+2} \leq \frac{13}{+2}$$

$$\frac{-12}{3} \leq \frac{-3n}{-3} \leq \frac{15}{3}$$

$$4 \geq n \geq -5$$





$$5. \frac{|x-7|}{3} \leq 5$$



$$|x-7| \leq 15$$

$$x-7 \leq 15$$

$$x \leq 22$$

$$x-7 \geq -15$$

$$x \geq -8$$

$$6. |-3x+5| < 17$$

$$-3x+5 < 17$$

$$-3x < 12$$

$$x > -4$$

$$-3x+5 > -17$$

$$-3x > -22$$

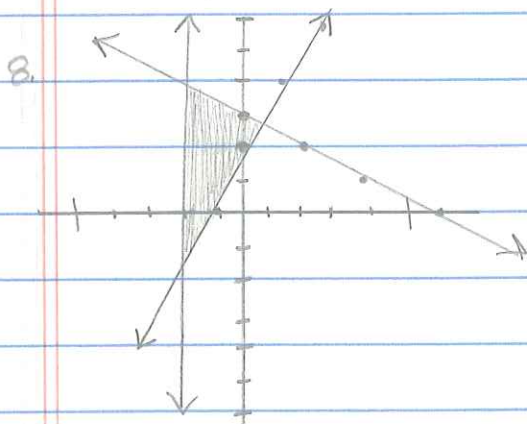
$$x < \frac{22}{3}$$

$$7. 7|m+10|+2 \leq -5$$

$$7|m+10| \leq -7$$

$$|m+10| \leq -1 \quad \text{No solution}$$

↑ absolute value can't be negative



$$x+2y \leq 6$$

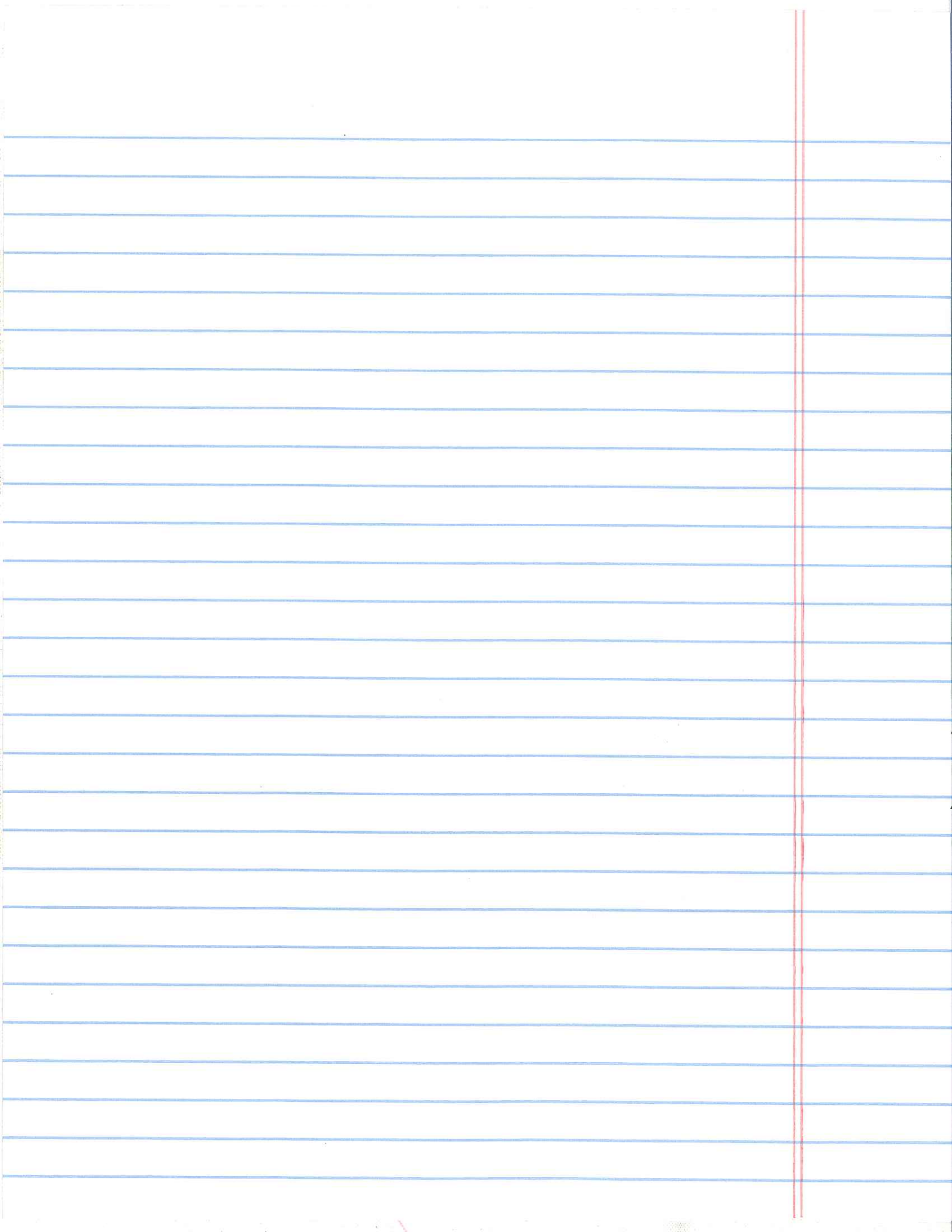
$$2y \leq -x+6$$

$$y \leq \frac{-1}{2}x+3$$

$$2x-y < -2$$

$$-y < -2x-2$$

$$y > 2x+2$$



$$9. \quad 3|x+4| - 5 < 16$$

$$3|x+4| < 21$$

$$|x+4| < 7$$

$$x+4 < 7$$

$$x < 3$$

$$x+4 > -7$$

$$x > -11$$

$$10. \quad 4 - 3x \leq -5$$

$$-3x \leq -9$$

$$x \geq 3$$

$$11. \quad 3x - y - 2z = 10$$

$$-5x - 4y + 6z = 9$$

$$-4x - 2y - 3z = 9$$

$$\begin{bmatrix} 3 & -1 & -2 \\ -5 & -4 & 6 \\ -4 & -2 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 10 \\ 9 \\ 9 \end{bmatrix}$$

A

B

$$A^{-1} \cdot B = X \rightarrow \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ -5 \\ -1 \end{bmatrix}$$

(on calc)

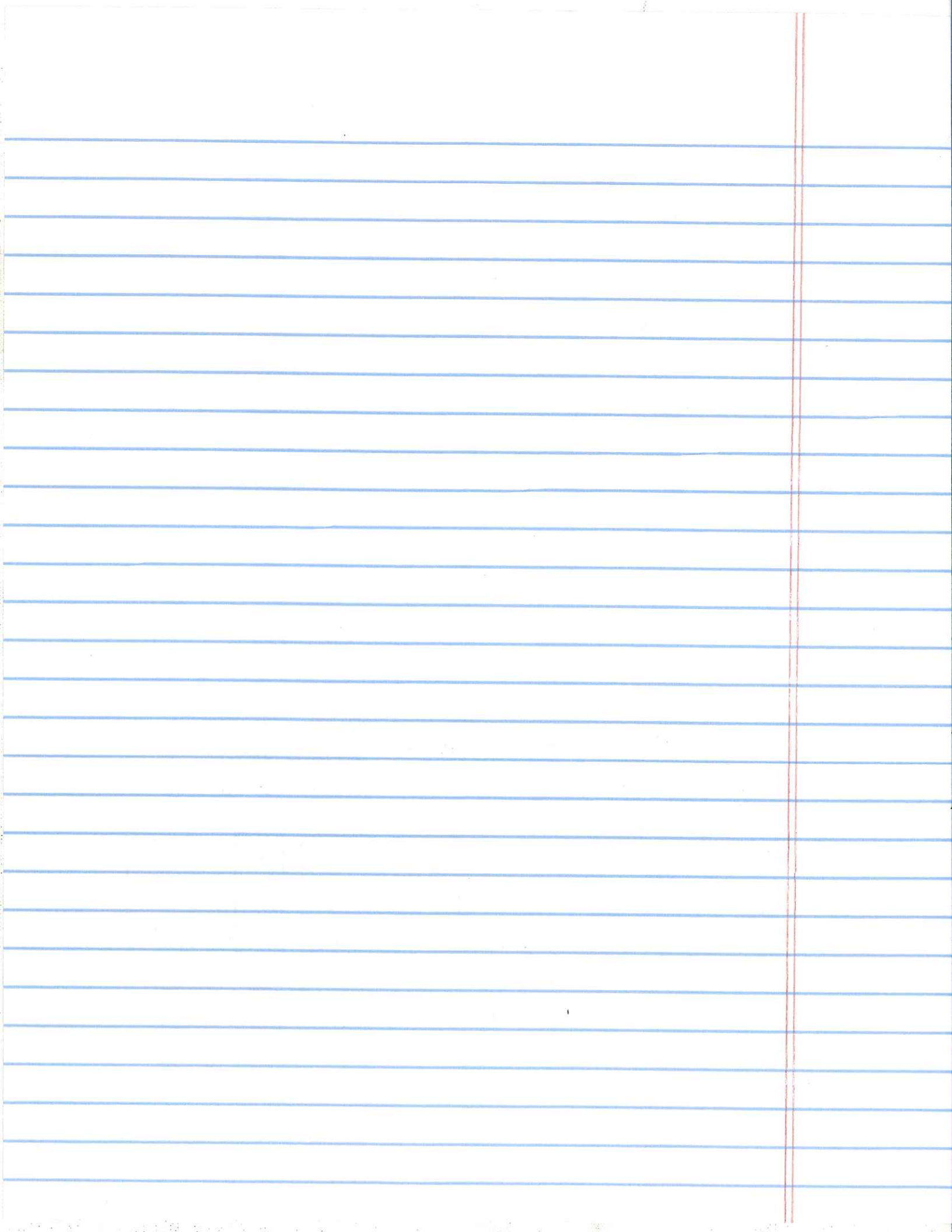
$$12. \quad 2x - y + 4z = -14$$

$$6x - 3y - 6z = 30$$

$$6x + 2y = -24$$

$$\begin{bmatrix} 2 & -1 & 4 \\ 6 & -3 & -6 \\ 6 & 2 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -14 \\ 30 \\ -24 \end{bmatrix}$$

$$A^{-1} \cdot B = X \quad \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -2 \\ -6 \\ -4 \end{bmatrix}$$



Solve algebraically (Substitution or Elimination)

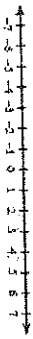
1. $4x + 5y = -9$
 $8x - y = -7$

2. $-x + y = -14$
 $-3x - 2y = -2$

3. $-9x - 6y = 27$
 $8x + 5y = -23$

Solve and graph the inequality:

4. $-14 \leq -2 - 3m \leq 13$



5. $\frac{|x-7|}{3} \leq 5$



Solve:

6. $|-3x + 5| < 17$

7. $7|m + 10| + 2 \leq -5$

8. Graph the system below and shade the solution area.

$x + 2y \leq 6$
 $2x - y < -2$
 $x \geq -2$

9. $3|x + 4| - 5 < 16$

10. $4 - 3x \leq -5$

Solve each system of equations. (Remember, we can set up a matrix equation!)

11. $3x - y - 2z = 10$
 $-5x - 4y + 6z = 9$
 $-4x - 2y - 3z = 9$

12. $2x - y + 4z = -14$
 $6x - 3y - 6z = 30$
 $6x + 2y = -24$

EOC practice questions

1) Find the solution set of $|x - 2| < 6$.

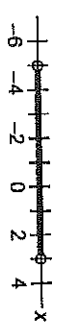
- A. $\{x | -8 < x < 4\}$
- B. $\{x | -4 < x < 8\}$
- C. $\{x | x < 4\}$
- D. $\{x | x < 8\}$

$x - 2 < 6$
 $x < 8$
 $x - 2 > -6$
 $x > -4$
 $-4 < x < 8$

3) Which graph represents this statement?
-12 is less than $x + 4$, and $x + 4$ is less than or equal to 15.

- A.
- B.
- C.
- D.

5) Which inequality represents the set of numbers shown by this number line?



- A. $|x + 1| < 8$
- B. $|x - 1| < 8$
- C. $|x + 1| < 4$
- D. $|x - 1| < 4$

$5 < x < 3$
 $-4 < x + 1 < 4$
 $|x + 1| < 4$

2) Which graph represents the solution set of $-16 < x - 3 < 14$?

- A.
- B.
- C.
- D.

4) Which inequality represents this statement?
On the real number line, x is less than 3 units away from 5.

- A. $x - 5 < 3$
- B. $x - 3 < 5$
- C. $|x - 5| < 3$
- D. $|x - 3| < 5$

6) Kickball games last a maximum of 60 minutes and ties are allowed. However, there is a "mercy" rule. A game will end if at least 40 minutes have passed and one team is ahead by at least 10 points. If t is time, in minutes, and d is the difference in points, what compound inequality describes the "mercy" rule?

- A. $t \geq 40$ and $d \geq 10$
- B. $40 \leq t < 60$ and $d \geq 10$
- C. $t \leq 40$ or $d \geq 10$
- D. $40 \leq t < 60$ or $d \geq 10$

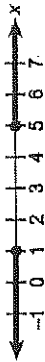
6) What is the value of y in the solution to this system of equations?

$$\begin{cases} 2x + y = 0 \\ 3x - z = 4 \\ x - y + z = 2 \end{cases}$$

$$\begin{bmatrix} 2 & 1 & 0 \\ 3 & 0 & -1 \\ 1 & -1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 4 \\ 2 \end{bmatrix}$$

- A. -6
- B. -2**
- C. 1
- D. 3

10) Which inequality describes this number line?



- A. $|x + 3| \leq 2$
- B. $|x + 3| \geq 2$
- C. $|x - 3| \leq 2$
- D. $|x - 3| \geq 2$**

7) What ordered triple is the solution to this system?

$$\begin{cases} 3a + 4b + c = 5 \\ a - 6b + 2c = 14 \\ \frac{1}{2}a - 2b + \frac{1}{3}c = 4 \end{cases}$$

$$\begin{bmatrix} 3 & 4 & 1 \\ 1 & -6 & 2 \\ \frac{1}{2} & -2 & \frac{1}{3} \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 5 \\ 14 \\ 4 \end{bmatrix}$$

- A. (2, -1, 3)**
- B. (0, 1, 1)
- C. (12, 2, 7)
- D. (6, 1, 6)

9) What is the solution set for $|2x + 9| \geq 3$?

calculator

$$2x + 9 \geq 3$$

$$\frac{-9}{2} \quad \frac{-9}{2}$$

$$2x \geq -6$$

$$x \geq -3$$

- A. $[3, \infty)$
- B. $(-\infty, -6] \cup [-3, \infty)$**
- C. $(-\infty, 3] \cup [6, \infty)$
- D. $[-6, -3]$

Answers

- 1) B
- 2) B
- 3) A
- 4) C
- 5) C
- 6) B
- 7) A
- 8) B
- 9) B
- 10) D

1) If A is a 3 x 2 matrix, B is a 3 x 3 matrix, and C is a 2 x 3 matrix, what are the dimensions of A x C x B?

$$(3 \times 2) (2 \times 3) (3 \times 3)$$

$$(3 \times 3) (3 \times 3)$$

$$(3 \times 3)$$

- A. 3 x 3**
- B. 2 x 2
- C. 2 x 3
- D. 18 x 18

2) A used bookstore sells paperback books for \$1.00 each, hardback books for \$3.00 each, and CDs for \$4.00 each. On Saturday, they sold 37 paperbacks, 52 hardbacks, and 42 CDs. What matrix operation would compute the store's total income for that day?

want 1 solution

$$\begin{bmatrix} 37 \\ 52 \\ 42 \end{bmatrix} \begin{bmatrix} \$1.00 & \$3.00 & \$4.00 \end{bmatrix}$$

$$3 \times 1 \quad 1 \times 3 \quad 3 \times 3 \quad 3 \times 3 \leftarrow \text{9 solutions}$$

$$\begin{bmatrix} \$1.00 & \$3.00 & \$4.00 \end{bmatrix} \begin{bmatrix} 37 \\ 52 \\ 42 \end{bmatrix}$$

$$\begin{bmatrix} 37 & \$1.00 \\ 52 & \$3.00 \\ 42 & \$4.00 \end{bmatrix}$$

3) Evaluate $\begin{vmatrix} 4 & 9 \\ 3 & -6 \end{vmatrix}$

- A. -51
- B. -3**
- C. 3
- D. 54

4) What is AB?

$$A = \begin{bmatrix} -3 & 1 \\ 6 & 0 \\ 4 & 2 \\ 9 & 7 \end{bmatrix}$$

$$B = \begin{bmatrix} 2 & 6 \\ 5 & 1 \end{bmatrix}$$

$$A. \begin{bmatrix} 52 & 156 \\ 130 & 26 \end{bmatrix}$$

$$B. \begin{bmatrix} -1 & -17 \\ 12 & 36 \\ 18 & 26 \\ 53 & 61 \end{bmatrix}$$

$$\det \begin{bmatrix} 4 & 9 \\ 3 & -6 \end{bmatrix} = -51$$

or use calc.

$$C. \begin{bmatrix} -6 & 6 \\ 30 & 0 \\ 8 & 12 \\ 45 & 7 \end{bmatrix}$$

$$D. \begin{bmatrix} -42 & 14 \\ 84 & 0 \\ 56 & 28 \\ 126 & 98 \end{bmatrix}$$

5) Find the inverse of $\begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix}$

- A. $\begin{bmatrix} 1 & -2 \\ -4 & 3 \end{bmatrix}$
 C. $\begin{bmatrix} -5 & 10 \\ 20 & -15 \end{bmatrix}$

B. $\begin{bmatrix} 3 & -4 \\ 5 & 1 \\ -2 & 1 \\ -2 & 5 \end{bmatrix}$
 D. $\begin{bmatrix} -1 & 2 \\ 5 & 5 \\ 4 & -3 \\ 5 & -5 \end{bmatrix}$

6) Carlos has investments in Funds A, B, and C. Each fund invests money in both stocks and bonds. The matrices show the dollar amounts invested in each fund and the annual yields. Use this information to determine how many dollars Fund B will earn in one year.

	Stocks	Bonds	Annual Yield
A	\$10,000	\$10,000	$\begin{bmatrix} .06 \\ .04 \end{bmatrix}$
B	\$15,000	\$ 5,000	$\begin{bmatrix} .06 \\ .04 \end{bmatrix}$
C	\$ 5,000	\$25,000	$\begin{bmatrix} .06 \\ .04 \end{bmatrix}$

- A. \$ 1,100
 B. \$ 1,500
 C. \$ 2,000
 D. \$20,000

7) Evaluate $\begin{vmatrix} 2 & 1 & 4 \\ 0 & 0 & 5 \\ 3 & -3 & 2 \end{vmatrix}$

- A. -15
 B. 14
 C. 15
 D. 45

8) Given $A = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 0 & -3 \end{bmatrix}$, what is AB ?

- A. $\begin{bmatrix} -3 \end{bmatrix}$
 B. $\begin{bmatrix} 6 \\ 0 \\ 9 \end{bmatrix}$
 C. $\begin{bmatrix} 1 & 6 \\ 2 & 0 \\ 3 & -3 \end{bmatrix}$
 D. $\begin{bmatrix} 6 & 0 & -3 \\ 12 & 0 & -6 \\ 18 & 0 & -9 \end{bmatrix}$

9) For Matrix B to be the inverse of Matrix A, what must be the value of x in Matrix B?

$$A = \begin{bmatrix} 1 & 3 \\ 5 & 10 \\ 2 & 1 \\ 3 & 10 \end{bmatrix} \quad B = \begin{bmatrix} x & 3 \\ 4 & -2 \end{bmatrix}$$

- A. -8
 B. -6
 C. -3
 D. -1

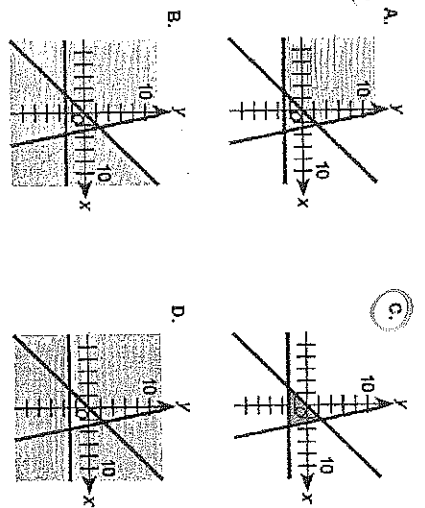
10) Among the matrices $\begin{bmatrix} 4 & -1 \\ 3 & 1 \end{bmatrix}$, $\begin{bmatrix} 4 & 0 & 1 & 2 & -3 \\ 1 & -2 & 7 & 0 & -9 \end{bmatrix}$, and $\begin{bmatrix} 2 & 2 \\ -14 & 2 \end{bmatrix}$, one has an inverse. Which matrix, and what is the inverse?

- 1) A
 2) A
 3) A
 4) B
 5) D
 6) A
 7) D
 8) D
 9) D

EOC Practice Problems – Systems of Equations, Inequalities & Linear Programming

1) Which graph represents the solution set to this system of equations?

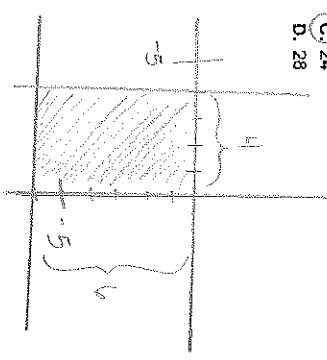
$$\begin{cases} y \leq x \\ y \geq -3 \\ y \leq 15 - 5x \end{cases}$$



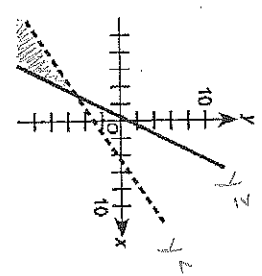
2) What is the area of the figure determined by this system of inequalities?

$$\begin{cases} 4 \leq x \leq 0 \\ -6 \leq y \leq 0 \end{cases}$$

- A. 6
 B. 15
 C. 24
 D. 28



3) Which system of inequalities describes this graph?



- A. $y > 2x + 1$ and $y \leq \frac{2}{3}x - 3$
 B. $y < 2x + 1$ and $y \leq \frac{2}{3}x - 3$
 C. $y \geq 2x + 1$ and $y < \frac{2}{3}x - 3$
 D. $y \leq 2x + 1$ and $y > \frac{2}{3}x - 3$

Only has an inverse if $\det \neq 0$

can only find determinant & inverse of square matrices.

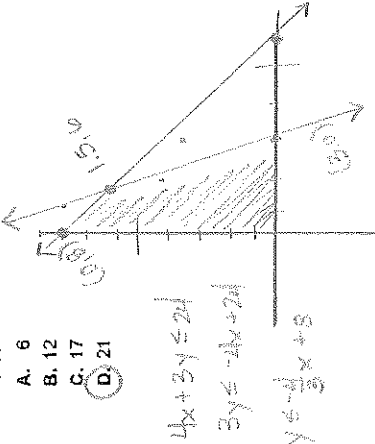
(2x2)
 (3x3)
 etc.

u

5) Which graph represents the solution set of this system of inequalities?

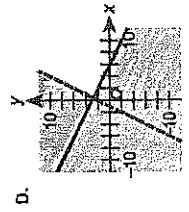
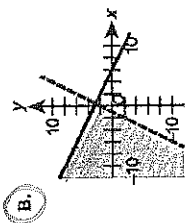
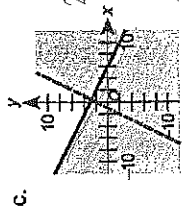
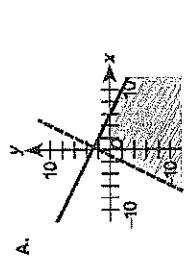
4) Given:
 $x \geq 0, y \geq 0$
 $4x + y \geq 12$
 $4x + 3y \leq 24$

What is the maximum value of the function $f(x,y) = 2x + 3y$?



- A. 6
- B. 12
- C. 17
- D. 21

$4x + 3y \leq 24$
 $3y \leq -4x + 24$
 $y \leq -\frac{4}{3}x + 8$



6) A candy company wants to sell cherry and caramel truffles in one package. The packages will contain between 12 and 15 truffles. At least 6 of each type will be in each package. The cost of making a cherry truffle is \$0.12 and the selling price is \$0.31. The cost of making a caramel truffle is \$0.09 and the selling price is \$0.29. To maximize profit, how many of each type of truffle should be in the package?

- A. 6 cherry, 6 caramel
- B. 6 cherry, 9 caramel
- C. 8 cherry, 7 caramel
- D. 9 cherry, 6 caramel

$x + y \geq 12$
 $x + y \leq 15$
 $x \geq 6$
 $y \geq 6$
 P = $19x + 20y$

8) A region is bounded by the inequalities

$x \geq 0$
 $y \geq 0$
 $-x + 3y \leq 15$
 $4x + y \leq 44$

Isobel would like to find the point in the region where the expression $2y - x$ reaches the minimum. To do so, she needs to evaluate the expression at which points in the region?

- (0,0)
- (0,5)
- (9,8)
- (11,0) Minimum

7

Factor completely.

1. $x^2 + 3x - 54 = (x+9)(x-6)$
2. $x^2 + 10x + 24 = (x+6)(x+4)$
3. $x^2 - 36 = (x+6)(x-6)$
4. $x^2 - 9x - 36 = (x-12)(x+3)$
5. $x^2 - 15x + 56 = (x-8)(x-7)$
6. $25x^2 + 70x + 49 = (5x+7)^2$
7. $7x^2 - 20x - 3 = (7x+1)(x-3)$
8. $5x^2 + 23x - 10 = (5x-2)(x+5)$
9. $\frac{1}{4}x^2 - 4 = \frac{1}{4}(x^2 - 16) = \frac{1}{4}(x+4)(x-4)$
10. $x^2 - 6x - 16 = (x-8)(x+2)$
11. $4x^2 + 12x + 40 = 4(x^2 + 3x + 10)$
12. $4x^2 - 6x + 9$ Not factorable

discriminant < 0

13. Marnie throws a softball straight up into the air. The ball leaves her hand when it is exactly 5 ft. from the ground. The height h of the ball, in feet, can be written as a function of time t , in seconds, as $h = -16t^2 + 40t + 5$.

- a. What is the maximum height the ball reaches? 30 ft
- b. Marnie catches the ball 5 ft. from the ground. How long was the ball in the air? 3.5 seconds

14. A toy rocket is fired upward from the ground. The relation between its height, h , in feet, and the time t from launch, in seconds, can be described by the equation $h = -16t^2 + 64t$. How long does the rocket stay more than 48 feet above the ground?

$48 < -16t^2 + 64t$
 $0 < -16t^2 + 64t - 48$
 $0 < -16(t^2 - 4t + 3)$
 $0 < -16(t-3)(t-1)$

8

$t = 3$ $t = 1$

between 1 and 3 seconds
 $1 < t < 3$

* See graphs on next page

- Answers
- 1) C
 - 2) C
 - 3) C
 - 4) D
 - 5) B
 - 6) B
 - 7) C

$t = 0$ $t = \frac{5}{2} = 2.5$

p.7 #5

$$x + 2y \leq 6$$

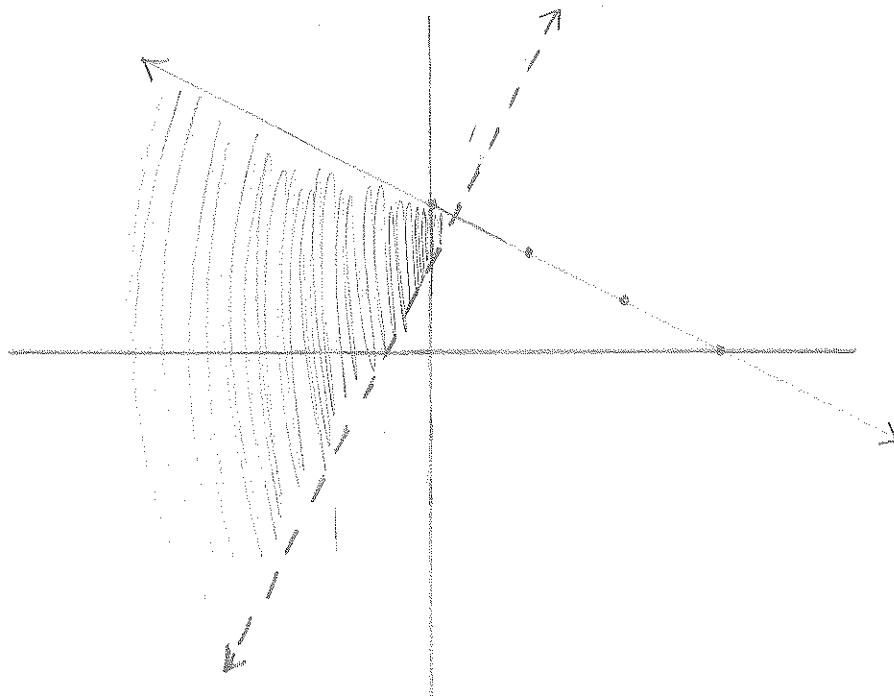
$$2y \leq -x + 6$$

$$y \leq -\frac{1}{2}x + 3$$

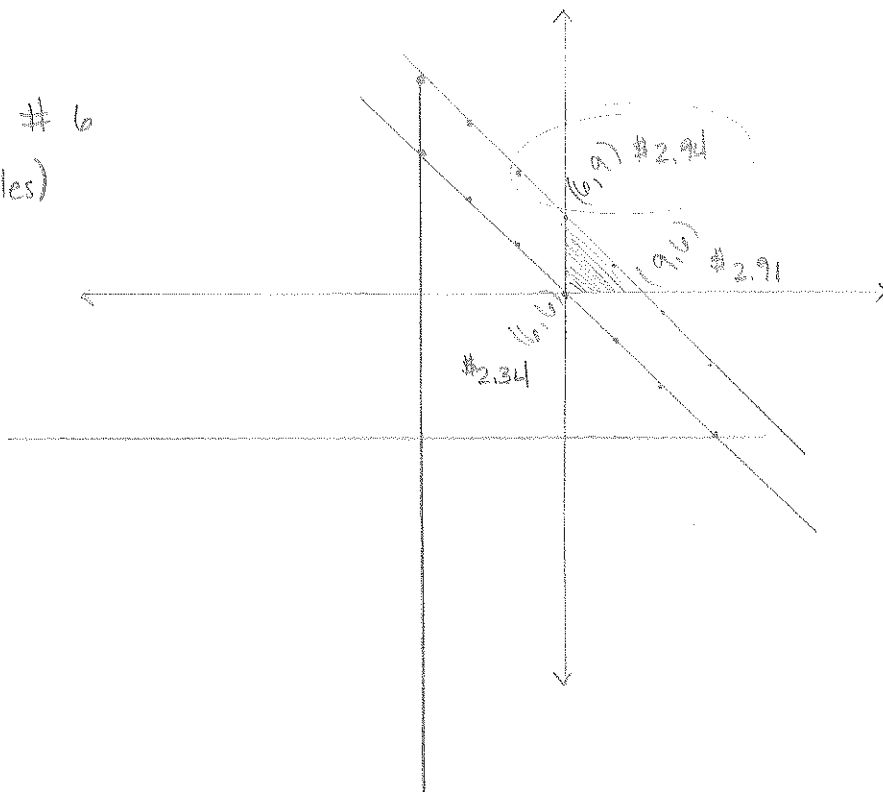
$$2x - y < -2$$

$$-y < -2x - 2$$

$$y > 2x + 2$$

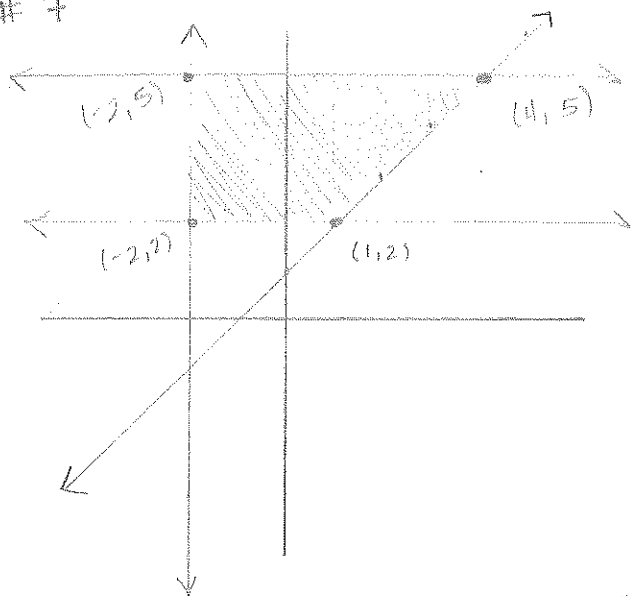


p.7 #6
(truffles)



$$P = .19x + .20y$$

p.7 #7



$$f(x, y) = 2x - 3y$$

$$(-2, 2) = -4 - 6 = -10$$

$$(-2, 5) = -4 - 15 = -19$$

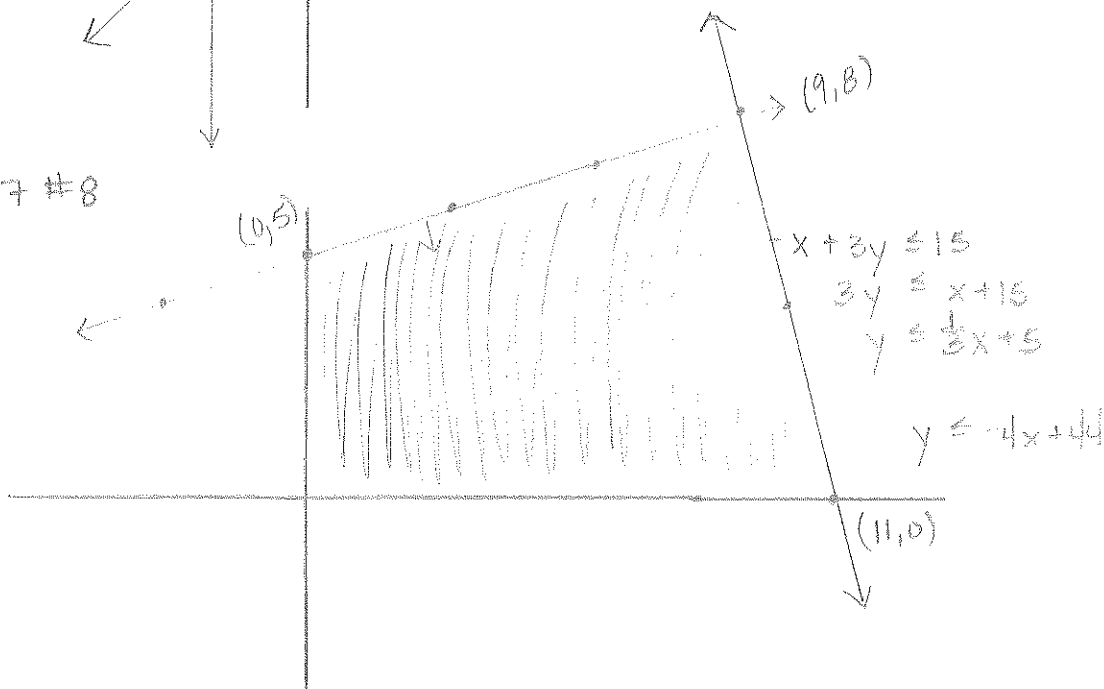
$$(1, 2) = 2 - 6 = -4$$

$$(4, 5) = 8 - 15 = -7$$

Min

Max

p.7 #8



$$x + 3y \leq 15$$

$$3y \leq x + 15$$

$$y \leq \frac{1}{3}x + 5$$

$$y \leq -4x + 44$$

$$(0, 0) \rightarrow 2y - x \quad 2(0) - 0 = 0$$

$$(0, 5) \rightarrow 2(5) - 0 = 10$$

$$(9, 8) \rightarrow 2(8) - 9 = 7$$

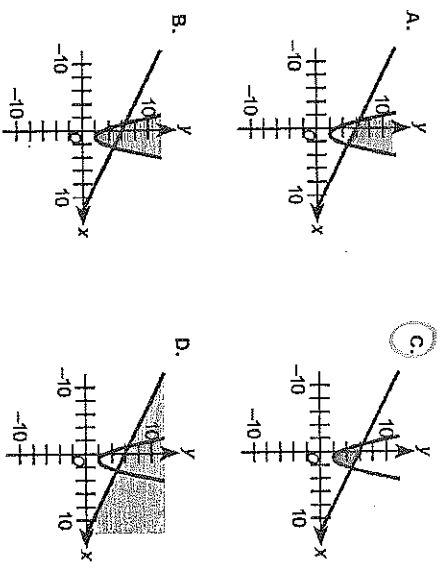
$$\star (11, 0) \rightarrow 2(0) - 11 = -11 \quad \text{Minimum}$$

1) Which transformations can be performed on the graph of $f(x) = x^2$ that result in the graph of $f'(x) = -2x^2 - 12x - 13$?

- A. Shift left 3 units, stretch horizontally by a factor of 2, reflect through the y-axis, and shift down 5 units
- B. Shift right 3 units, stretch horizontally by a factor of 2, reflect through the y-axis, and shift down 5 units
- C. Shift left 3 units, stretch vertically by a factor of 2, reflect through the x-axis, and shift up 5 units
- D. Shift right 3 units, stretch vertically by a factor of 2, reflect through the x-axis, and shift down 5 units

3) Which graph represents the solution set of this system of inequalities?

$$\begin{cases} y \geq x^2 - 2x + 3 \\ x + 2y \leq 12 \end{cases}$$



Complete the square
 $-2(x^2 + 6x + 9) - 13 + 18$
 $-2(x+3)^2 + 5$

$x + 2y \leq 12$
 $2y \leq -x + 12$
 $y \leq -\frac{1}{2}x + 6$

shade above parabola & below line

4) Which function has the same range as $y = (x+3)^2$?

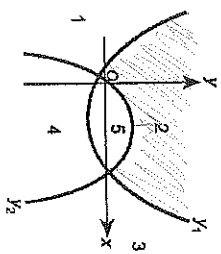
- A. $y = (x+3)^2 - 2$ $[-2, \infty)$
- B. $y = x^2 + 9$ $[9, \infty)$
- C. $y = 2(x-3)^2 + 1$ $[1, \infty)$
- D. $y = (x-5)^2$ $[0, \infty)$

R: $[0, \infty)$

5) Determine the domain and range of $y = 2x^2 + 2x - 4$.

- A. Domain: $-2 \leq x \leq 1$
Range: $y \geq -\frac{9}{2}$ and $y \leq \frac{9}{2}$
- B. Domain: all real numbers
Range: $-2 \leq x \leq 1$
- C. Domain: all real numbers
Range: $y \leq -\frac{9}{2}$
- D. Domain: all real numbers $(-\infty, \infty)$
Range: $y \geq -\frac{9}{2}$ $[-\frac{9}{2}, \infty)$

7) This graph shows $y_1 = x^2 - 3x - 5$ and $y_2 = -x^2 + 4x + 1$.



What region(s) should be shaded to represent this system of inequalities?

- A. 2
- B. 5
- C. 2 and 3
- D. 2 and 5

$$\begin{cases} y_1 \geq x^2 - 3x - 5 & \text{above } y_1 \\ y_2 \geq -x^2 + 4x + 1 & \text{above } y_2 \end{cases}$$

6) Which equation is the reflection of $y = x^2 - 4x + 3$ across the x-axis?

- A. $y = x^2 - 4x + 3$
- B. $y = x^2 - 4x - 3$
- C. $y = -x^2 + 4x - 3$
- D. $y = -x^2 + 4x + 3$

$y = -(x^2 - 4x + 3)$
 $= -x^2 + 4x - 3$

8) What is the range of $y = 3x^2 - 2x + 5$?

- A. $[\frac{5}{3}, \infty)$
- B. $[\frac{14}{3}, \infty)$
- C. $(-\infty, \frac{14}{3}]$
- D. $(-\infty, \frac{5}{3}]$

Graph on calc. Find min/max.

Find vertex $x = \frac{-b}{2a}$
 $x = \frac{2}{2(3)} = \frac{1}{3}$
 $y = 3(\frac{1}{3})^2 - 2(\frac{1}{3}) + 5 = \frac{14}{3}$

9) A certain relation is defined by these ordered pairs:

$$\{(2,2), (-2,2), (2,-2), (-2,-2)\}$$

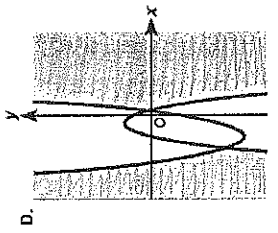
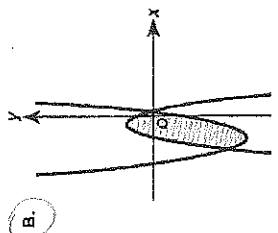
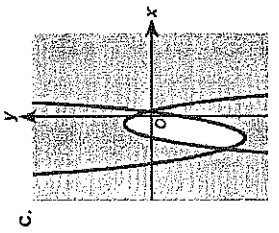
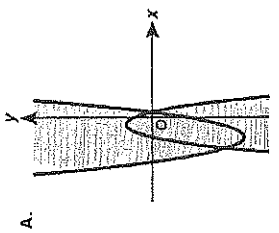
If this relation is translated 5 units to the right, what is the resulting relation?

- A. $\{(2,7), (-2,7), (2,3), (-2,3)\}$
- B. $\{(7,7), (5,7), (7,3), (3,3)\}$
- C. $\{(10,2), (-10,2), (10,-2), (-10,-2)\}$
- D. $\{(7,2), (3,2), (7,-2), (3,-2)\}$

+5 to all x values

system of inequalities?

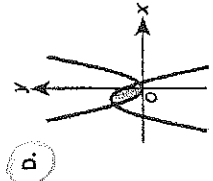
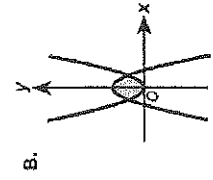
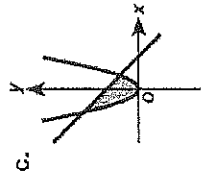
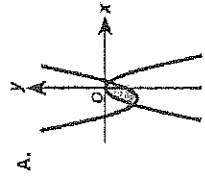
$$\begin{cases} y \geq x^2 + 6x - 5 \\ y \leq -x^2 - 2x + 3 \end{cases}$$



11) Which is the graphical representation of the solution set for this system of inequalities?

$$\begin{cases} y \geq x^2 \\ y \leq -(x+1)^2 + 3 \end{cases}$$

Upside down, left 1, up 3



12) If $f(x) = |x - 1| - 2$, what is the vertex of $y = f(x + 2) - 1$?

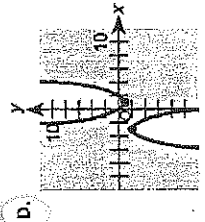
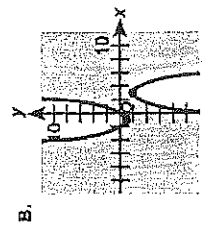
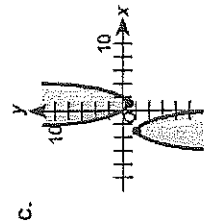
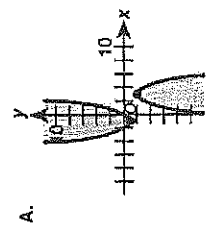
- A. (-2, -1)
- B. (-1, -3)**
- C. (2, -1)
- D. (3, -3)

$$f(x) = |(x+2) - 1| - 2 - 1$$

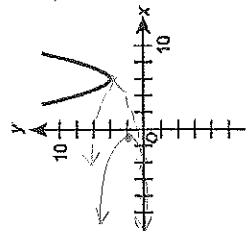
$$|x + 1| - 3$$

13) Which graph represents the solution set to this system of quadratic inequalities?

$$\begin{cases} y \geq -(x-3)^2 - 2 \\ y \leq (x+1)^2 - 1 \end{cases}$$



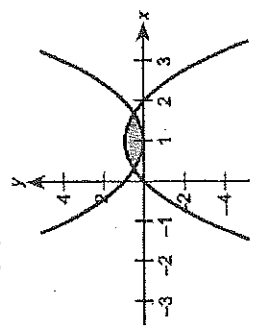
14) This graph of the function $f(x)$ is rotated 90° counterclockwise about the vertex and then shifted down 2 units and to the left 7 units. Which equation will describe the new graph?



** We didn't learn this*

- A. $x = -(y - 6)^2 + 13$
- B. $x = -(y - 2)^2 - 1$**
- C. $x = (y - 2)^2 - 13$
- D. $x = (y - 2)^2 - 1$

15) Which system of inequalities describes the shaded region in this graph?



- A. $0.5 \leq x \leq 1.5$ and $0 \leq y \leq 1$
- B. $y \geq x^2$ and $y \leq -x^2$
- C. $x^2 \leq y \leq -x^2 + 1$
- D. $y \geq (x - 1)^2$ and $y \leq -(x - 1)^2 + 1$**

Answers: 1) C 2) D 3) C 4) D 5) D 6) C 7) A 8) B 9) D 10) B 11) D 12) B 13) B 14) B 15) D

1) What are the zeros of the quadratic function $f(x) = x^2 + 3x + 1$?

- A. $\frac{-3 \pm \sqrt{5}}{2}$
 B. $\frac{-3 \pm \sqrt{13}}{2}$
 C. $\frac{3 \pm \sqrt{5}}{2}$
 D. $\frac{3 \pm \sqrt{13}}{2}$

$$\frac{-3 \pm \sqrt{9 - 4(1)(1)}}{2}$$

$$\frac{-3 \pm \sqrt{5}}{2}$$

3) What is the solution set for $5t^2 + 6 = 8t$?

- A. $\{-\frac{3}{5} \pm \frac{1}{5}\sqrt{31}\}$
 B. $\{\frac{4}{5} \pm \frac{2}{5}\sqrt{14}\}$
 C. $\{-\frac{4}{5} \pm \frac{1}{5}\sqrt{14}\}$
 D. $\{\frac{4}{5} \pm \frac{1}{5}\sqrt{14}\}$

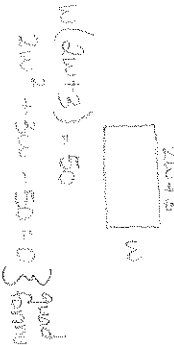
$$5t^2 - 8t + 6 = 0$$

$$t = \frac{8 \pm \sqrt{64 - 4(5)(6)}}{10}$$

$$t = \frac{8 \pm \sqrt{84 - 120}}{10} = \frac{8 \pm 2\sqrt{21}}{10}$$

5) Monte has a small rectangular herb garden that has a length 3 yd longer than twice its width. If the area of the garden is 50 yd², what is the length of the garden, to the nearest tenth of a yard?

- A. 4.3
 B. 7.3
 C. 11.6
 D. 37.4



7) For the equation $x^2 - 4x + 4 = 9$, determine the discriminant.

- A. -36
 B. 0
 C. 6
 D. 36

$$x^2 - 4x - 5 = 0$$

$$b^2 - 4ac =$$

$$16 - 4(1)(-5) =$$

$$16 + 20 = 36$$

13

2) For what values of c will $x^2 + 4x + c = 0$ have 2 complex conjugate roots?

- A. $c < 2$
 B. $c > 2$
 C. $c < 4$
 D. $c > 4$

$$b^2 - 4ac < 0$$

$$16 - 4(c) < 0$$

$$16 - 4c < 0$$

$$-4c < -16$$

$$c > 4$$

4) The height above ground of an object thrown upward from an initial height of s ft with an initial velocity of v ft/sec is modeled by $h(t) = -16t^2 + vt + s$. Javier throws a baseball upward at 80 ft/sec from a platform 64 ft above the ground. To the nearest tenth of a second, when will the baseball hit the ground?

- A. 0.7
 B. 2.5
 C. 6.0
 D. 5.7

$$h(t) = -16t^2 + 80t + 64$$

$$-16(t^2 - 5t - 4) = 0$$

$$t = \frac{5 \pm \sqrt{25 - 4(16)(-4)}}{2}$$

6) What are the roots of this equation?

- A. $-1 \pm \sqrt{11}$
 B. $-2 \pm \sqrt{11}$
 C. $-2 \pm 2\sqrt{11}$
 D. $-1 \pm 2\sqrt{11}$

$$x^2 + 2x + 12 = 0$$

$$x = \frac{-2 \pm \sqrt{4 - 4(12)}}{2}$$

$$= \frac{-2 \pm \sqrt{-44}}{2} = \frac{-2 \pm 2i\sqrt{11}}{2}$$

8) What is the solution set of $\frac{2}{3}x^2 + 1 = x - \frac{1}{2}$?

- A. $\{\frac{3 \pm 3\sqrt{3}}{4}\}$
 B. $\{\frac{3 \pm 3\sqrt{5}}{4}\}$
 C. $\{\frac{-3 \pm 3\sqrt{3}}{4}\}$
 D. $\{\frac{-3 \pm \sqrt{3}}{4}\}$

$$\left(\frac{2}{3}x^2 - x + \frac{3}{2} = 0\right) \cdot 6$$

$$4x^2 - 6x + 9 = 0$$

$$6 \pm \sqrt{36 - 4(4)(9)}$$

$$\frac{6 \pm \sqrt{-108}}{8}$$

Reduce

9) What are the solutions for $x^2 = -4x + 7$?

- A. $-2 \pm \sqrt{11}$
 B. $-4 \pm \sqrt{23}$
 C. $-7, 1$
 D. $2 \pm \sqrt{3}$

$$x^2 + 4x - 7 = 0$$

quad formula

11) What condition will yield non-real zeros of a quadratic function $f(x) = ax^2 + bx + c$?

- A. $-b < b^2$
 B. $b^2 < 4ac$
 C. $2a < 0$
 D. $b^2 > 4ac$

$$b^2 - 4ac < 0$$

Answers

- 1) A
 2) D
 3) D
 4) C
 5) C
 6) C
 7) D
 8) A
 9) A
 10) D
 11) B
 12) D

10) The formula $L = 0.1s^2 - 3s + 22$ gives the approximate runway length required to land a small plane. L is the length of the runway, in feet, and s is the landing speed of the airplane, in feet per second. The pilot knows that the runway is 2,400 ft long. To the nearest foot per second, what is the maximum safe landing speed?

- A. 50
 B. 90
 C. 140
 D. 170

$$2400 = 0.1s^2 - 3s + 22$$

$$0 = 0.1s^2 - 3s - 2378$$

quad formula

12) What are the solutions of $4x^2 = 3x - 2$?

- A. $\frac{-3 \pm \sqrt{41}}{8}$
 B. $\frac{3 \pm 4\sqrt{2}}{8}$
 C. $\frac{3 \pm \sqrt{35}}{8}$
 D. $\frac{3 \pm \sqrt{23}}{8}$

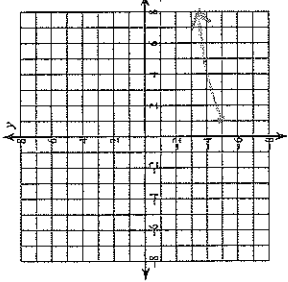
$$4x^2 - 3x + 2 = 0$$

quad formula

14

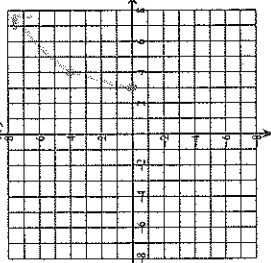
Sketch the graph. Identify the domain and range of each. Describe each transformation.

1) $y = \frac{1}{2}\sqrt{x-1} - 5$



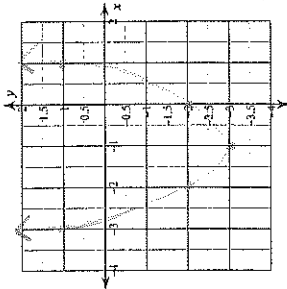
Stretch by 1/2
Rt 1
Dwn 5
D: [1, ∞)
R: [-5, ∞)

2) $y = 4\sqrt{x-3}$



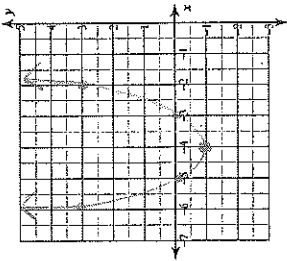
Stretch 4
Rt 3
D: [3, ∞)
R: [0, ∞)

3) $y + 3 = (x + 1)^2$



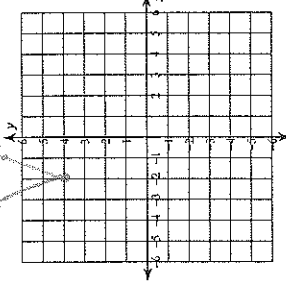
$y = (x+1)^2 - 3$
Left 1
Down 3
D: (-∞, ∞)
R: [-3, ∞)

4) $y + 1 = (x + 4)^2$



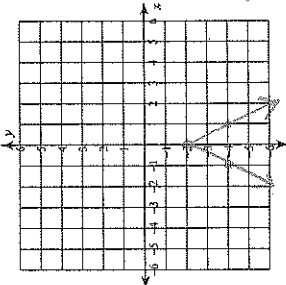
$y = (x+4)^2 - 1$
Left 4
Down 1
D: (-∞, ∞)
R: [-1, ∞)

5) $y = 3|x+2| + 4$



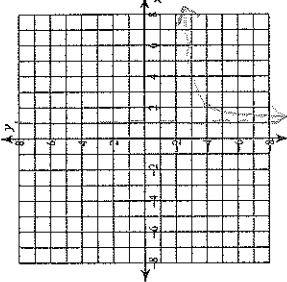
Stretch 3
Left 2
Up 4
D: (-∞, ∞)
R: [4, ∞)

6) $y = -2|x| - 2$



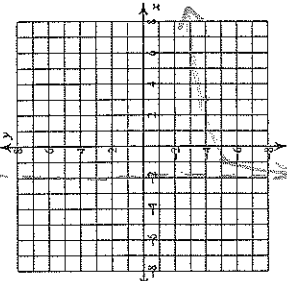
Reflect over x axis
Stretch by 2
Down 2
D: (-∞, ∞)
R: (-∞, -2]

7) $f(x) = \log_5(x-1) - 4$



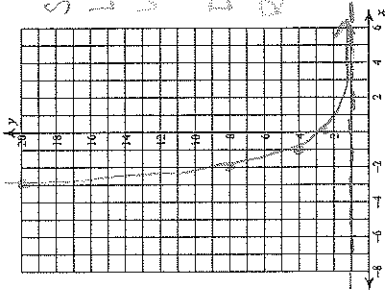
Rt 1
Dwn 4
D: (1, ∞)
R: (-∞, ∞)

8) $f(x) = \log_5(x+2) - 5$



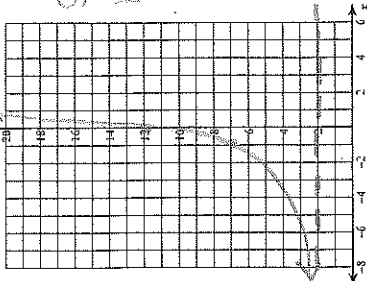
Left 2
Dwn 5
D: (-2, ∞)
R: (-∞, ∞)

9) $y = 2 \cdot \left(\frac{1}{3}\right)^{x+1} + 1$



Stretch by 2
Left 1
Up 1
D: (-∞, ∞)
R: (1, ∞)

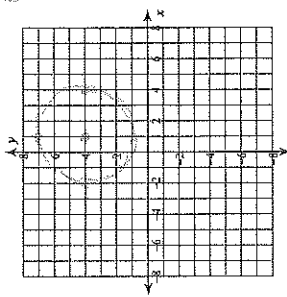
10) $y = 5 \cdot 2^{x+1} + 2$



Stretch by 5
Left 1
Up 2
D: (-∞, ∞)
R: (2, ∞)

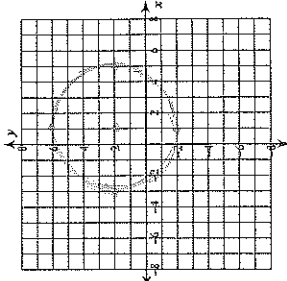
Identify the center and radius of each. Then sketch the graph.

11) $(x-1)^2 + (y-4)^2 = 9$



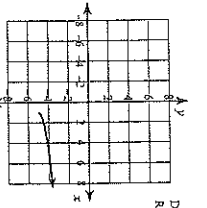
C: (1, 4)
r=3

12) $(x-1)^2 + (y-2)^2 = 16$

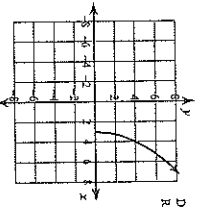


C: (1, 2)
r=4

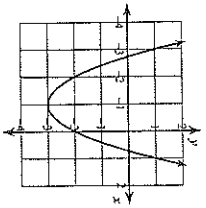
2)



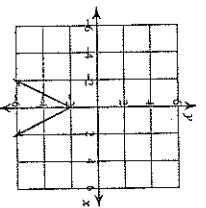
Domain: $x \geq 1$
Range: $y \geq -5$



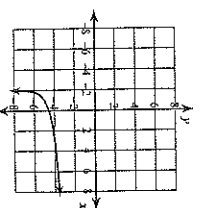
Domain: $x \geq 3$
Range: $y \geq 0$



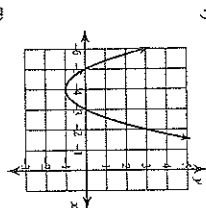
6)



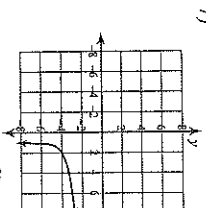
8)



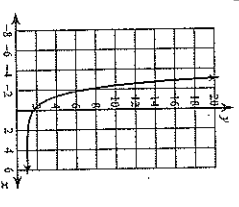
Domain: $x \geq -2$
Range: All reals



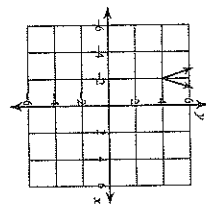
7)



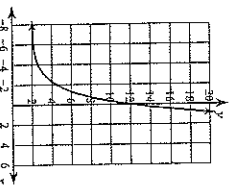
9)



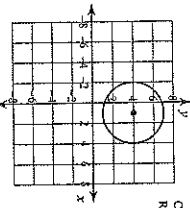
Domain: $x > 1$
Range: All reals



10)

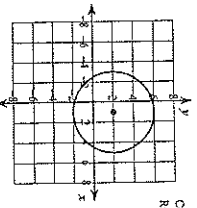


11)



Center: (1, 4)
Radius: 3

12)



Center: (1, 2)
Radius: 4

1) Given that $f(-3) = 0$, $f(-1) = 0$, completely factor $f(x) = x^4 + 5x^2 + 3x^2 - 13x - 12$ over the integers.

- A. $(x - 3)(x - 1)(x + 2)(x - 2)$
- B. $(x + 3)(x + 1)(x + 2)(x - 2)$
- C. $(x - 3)(x - 1)(x^2 + x - 4)$
- D. $(x + 3)(x + 1)(x^2 + x - 4)$

$(x+3)(x+1)(x^2+x-4)$

2) Which expression is the completely factored form of $2x^4 - 58x^2 + 200x$?

- A. $2x(x^4 - 29x^2 + 100)$
- B. $2x(x^2 - 4)(x^2 - 25)$
- C. $2(x + 2)(x - 2)(x + 5)(x - 5)$
- D. $2x(x + 2)(x - 2)(x + 5)(x - 5)$

$2x(x^4 - 29x^2 + 100)$
 $2x(x^2 - 25)(x^2 - 4)$
 $2x(x - 5)(x + 5)(x + 2)(x - 2)$

3) What is the completely factored form of this expression?

$2x^2 - 9x^2 + 7x + 6$

- A. $(x + 2)(2x + 1)(x - 3)$
- B. $(x + 2)(2x - 1)(x - 3)$
- C. $(x - 2)(2x + 1)(x - 3)$
- D. $(x - 2)(2x - 1)(x + 3)$

$2x^2 - 9x^2 + 7x + 6$
 $2x^2 - 10x^2 + 6x + 6$
 $2x^2 - 10x^2 + 6x + 6$
 $2x^2 - 10x^2 + 6x + 6$

4) A fourth degree polynomial, $P(x)$, with real coefficients has 4 distinct zeros. Two of them are -5 and i . What can be concluded about the other zeros?

- A. The other zeros must be 5 and $-i$.
- B. One of the other zeros must be $-5 \pm i$.
- C. One of the other zeros must be $5 \pm i$.
- D. The other zeros must be $-i$ and a real number.

$(x-2)(x-3)(2x+1)$

13) Write a polynomial function of least degree given the roots of the polynomial. 3, 5, $-\frac{2}{3}$

14) Write a polynomial function of least degree given the roots of the polynomial. $\frac{5}{2}, 1-3i$

Answers

1. D
2. D
3. C
4. D
5. A
6. B
7. D
8. D
9. $x^2 - 2$
10. $x^2 - 3x + 20 + \frac{-48}{x+3}$
11. $x = 3, x = \pm 2i$
12. $x = -2, x = -\frac{2}{5}, x = \frac{1}{3}$
13. $f(x) = 3x^3 - 22x^2 + 29x + 30$
14. $f(x) = 2x^3 - 9x^2 + 30x - 50$

13. $(x-3)(x-5)(3x+2)$
 $(x^2 - 8x + 15)(3x+2)$
 $3x^3 + 2x^2 - 24x^2 - 16x + 45x + 30$
 $3x^3 - 22x^2 + 29x + 30$

14. $(2x-5)(x-(1-3i))(x-(1+3i))$
 $(2x-5)(x-1+3i)(x-1-3i)$
 $(2x-5)(x-1)^2 - 9i^2$
 $(2x-5)(x^2 - 2x + 1 + 9)$
 $(2x-5)(x^2 - 2x + 10)$
 $2x^3 - 4x^2 + 20x - 5x^2 + 10x - 50$
 $2x^3 - 9x^2 + 30x - 50$

5) What are the rational zeros for $x^3 - 3x^2 - 4x + 12$?
 A. -2, 2, 3
 B. -2, 2, -3
 C. 1, 2, 3, 4, 6, 12
 D. $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$

6) The zeros of the polynomial function $f(x) = x^3 + bx^2 + cx + d$ are 2, 1, and -1. Which equation could be used to represent $f(x)$?
 A. $f(x) = x^3 + 2x^2 + x - 2$
 B. $f(x) = x^3 - 2x^2 - x + 2$
 C. $f(x) = x^3 + 2x^2 - x - 2$
 D. $f(x) = x^3 - 2x^2 + x + 2$

$(x-2)(x-1)(x+1)$
 $(x-2)(x^2-1)$
 $x^3 - 2x^2 - x + 2$

7) How many rational zeros does this polynomial function have?
 $f(x) = (x^4 - 16)(3x^2 - 21)(4x^2 + 1)$

A. 8
 B. 6
 C. 4
 D. 2

$(x^4 - 16)(x^2 - 4)$
 $x^2 - 2 = 0 \Rightarrow x = \pm 2$
 $3x^2 - 21 = 0 \Rightarrow 4x^2 + 1 = 0$
 $3x^2 = 21 \Rightarrow 4x^2 = -1$
 $x^2 = 7 \Rightarrow x^2 = -\frac{1}{4}$
 $x = \pm \sqrt{7}$
 $x = \pm \frac{1}{2}i$

8) A certain polynomial has these factors and no others: $(3x-2), (x^2-1),$ and $(x+4)$. What are the zeros of this polynomial?
 A. 4, -2, -1
 B. 4, 1, 2
 C. -4, $\frac{2}{3}, 1$
 D. -4, -1, $\frac{2}{3}, 1$

$3x-2=0 \Rightarrow x = \frac{2}{3}$
 $(x+4)(x-1)=0 \Rightarrow x = -4, x = 1$
 $x^2-1=0 \Rightarrow x = \pm 1$

9) Divide. $(x^4 + x^2 - 6) \div (x^2 + 3)$

Long

10) Divide. $(x^3 + 11x + 12) \div (x+3)$

Synthetic

11) Find the roots of the polynomial. $x^3 - 3x^2 + 4x - 12 = 0$

$x = 3, x = \pm 2i$

12) Find the roots of the polynomial. $45x^3 + 93x^2 - 12 = 0$

$x = 2, -\frac{2}{3}, \frac{1}{3}$

$x^3 - 3x^2 - 11x - 12 = 0$
 $x^2(x-3) - 4(x-3) = 0$
 $(x-3)(x^2 - 4) = 0$
 $x = 3, x = -2, x = 2$

19 From table $\rightarrow 2$ is a root

$2 \mid 15 \ 3 \ 1 \ 0 \ -4$
 $\underline{-30 \ -2 \ 4}$
 $15 \ 1 \ -2 \ 0$
 $15x^2 + x - 2$
 $(5x+2)(3x-1)$

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

1. Simplify the expression: $3(x^2 + 2) - 5(2x^2 + 3x - 4) + 2(-x^2 - 4)$

- A. $-5x^2 - 15x + 18$
- B. $-5x^2 + 15x - 22$
- C. $-9x^2 - 15x + 18$
- D. $-9x^2 + 15x - 22$

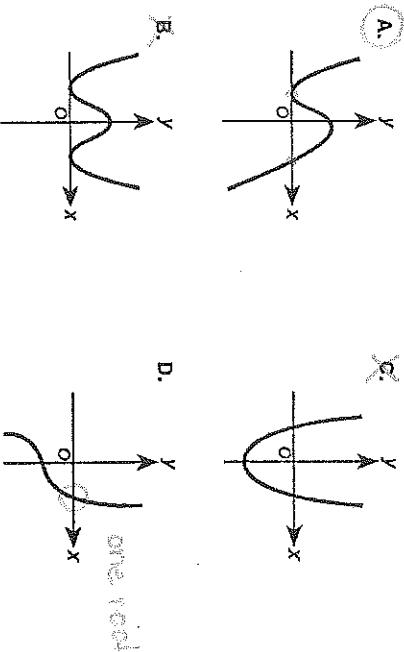
$$3x^2 + 6 - 10x^2 - 15x + 20 - 2x^2 - 8 = -9x^2 - 15x + 18$$

2. Which is an equivalent form of this expression? $(3x + 2)(x - 5) - 6(x - 1)$

- A. $3x^2 - 6x - 9$
- B. $3x^2 - 7x - 11$
- C. $3x^2 - 9x - 16$
- D. $3x^2 - 19x - 4$

$$3x^2 - 15x + 2x - 10 - 6x + 6 = 3x^2 - 19x - 4$$

3. Which graph could represent a cubic function with two distinct real zeros?



4. How many real zeros does $h(t)$ have?

- A. 3
- B. 2
- C. 1
- D. 0

$$h(t) = 4t^3 - 2t^2 + t - 10$$

look at graph on calculator

5. Julio throws an inflated ball up in the air. The function $h(t) = -\frac{1}{20}t^2 + \frac{1}{10}t + 4$ models the ball's height in terms of time t , in seconds. After how many seconds will the ball hit the ground?

- A. 0
- B. 4
- C. 8
- D. 10

$$0 = t^2 - 2t - 80$$

$$0 = (t - 10)(t + 8)$$

7. How many times does $f(x) = 4x^3 - 3x$ cross the x-axis?

- A. 2
- B. 3
- C. 4
- D. 5

look at graph on calculator

8. Find all zeros of $f(x) = x^4 - 1$.

- A. $x = -1, 1$
- B. $x = 1, i$
- C. $x = 1, i, -i$
- D. $x = 1, -1, i, -i$

see #5 on p. 19

6. What are the rational zeros for $x^3 - 3x^2 - 4x + 12$?

- A. -2, 2, 3
- B. -2, 2, -3
- C. 1, 2, 3, 4, 6, 12
- D. ±1, ±2, ±3, ±4, ±6, ±12

Repeat question

9. A certain seventh degree polynomial function can be factored as:

$$(x + 2)^2(x^2 + 1)(x - 5)^3$$

How many x-intercepts does this function have?

- A. 2
- B. 3
- C. 5
- D. 7

$$(x + 2)(x + 2)(x^2 + 1)(x - 5)(x - 5)(x - 5) = 0$$

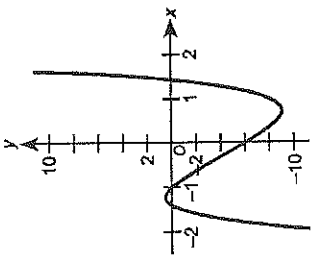
$$x = -2 \quad x = 5$$

$$x^2 = -1$$

$$x = \pm i$$

Not an intercept

10. The graph shows a fifth degree polynomial function $y = p(x)$.



3 real \rightarrow bc crosses 3 times
 2 imaginary \rightarrow Has to have 5 roots total
 * All imaginary come in pairs

What is the nature of the roots of $y = p(x)$?

- A. 3 real and 0 imaginary
 B. 3 real and 2 imaginary
 C. 0 real and 5 imaginary
 D. 5 real and 0 imaginary

11. Which of the following lists best describes the five complex zeros of the function $2x^5 + 3x^4 + 11x^3 + 24x^2 - 63x - 27$?

- A. Three rational, two nonreal
 B. Two rational, one irrational, two nonreal
 C. One rational, two irrational, two nonreal
 D. One rational triple root, two irrational

Look at graph on calc.
 Crosses x axis 3 times.
 Only rational one is 5.

So (1 real & rational)
 Needs total (2 real & irrational)
 (2 imaginary)

Answers

1. C
 2. D
 3. A
 4. C
 5. D
 6. A
 7. B
 8. D
 9. A
 10. B
 11. C

Properties of Logarithms

Definition of Logarithm (Loopy Thingy)

$$\log_b a = x \leftrightarrow b^x = a$$

Product Rule

$$\log_b (mn) = \log_b m + \log_b n$$

Quotient Rule

$$\log_b \frac{m}{n} = \log_b m - \log_b n$$

Power Rule

$$\log_b m^r = r \cdot \log_b m$$

Condensing an expression.

$2 \log x + \log y - \frac{1}{2} \log z$	$= \log x^2 + \log y - \log \sqrt{z}$	Power property
	$= \log x^2 y - \log \sqrt{z}$	Product property
	$= \log \frac{x^2 y}{\sqrt{z}}$	Quotient property

Expanding an expression.

$\log_3 \sqrt{xy}$	$= \log_3 (xy)^{\frac{1}{2}}$	rewrite using exponential notation
	$= \frac{1}{2} \log_3 xy$	Power property
	$= \frac{1}{2} (\log_3 x + \log_3 y)$	Product property

Logarithm and Exponential Practice

Evaluate each expression.

1) $\log_3 \frac{1}{27}$
 $3^x = \frac{1}{27}$
 $x = -3$

2) $\log_{16} 4$
 $16^x = 4$
 $x = \frac{1}{2}$

3) $\log_2 32$
 $2^x = 32$
 $x = 5$

4) $\log_6 216$
 $6^x = 216$
 $x = 3$

5) $\log_7 343$
 $7^x = 343$
 $x = 3$

6) $\log_2 \frac{1}{16}$
 $2^x = \frac{1}{16}$
 $x = -4$

7) $\log_3 \frac{1}{243}$
 $3^x = \frac{1}{243}$
 $x = -5$

8) $\log_3 27$
 $3^x = 27$
 $x = 3$

Rewrite each equation in exponential form.

9) $\log_x y = \frac{1}{2}$
 $x^{\frac{1}{2}} = y$

10) $\log_{1000} \frac{1}{1000} = -3$
 $10^x = \frac{1}{1000}$

11) $\log_7 103 = n$
 $7^n = 103$

12) $\log_9 70 = b$
 $9^b = 70$

25

Expand each logarithm.

13) $\log_3 \left(\frac{23^6}{5} \right) = \log_3 23^6 - \log_3 5 = 3 \log_3 2 - \log_3 5$

14) $\log_3 (2b^4) = \log_3 2 + \log_3 b^4 = \log_3 2 + 4 \log_3 b$

15) $\log_4 (x \cdot y \cdot z^6) = \log_4 x + \log_4 y + \log_4 z^6 = \log_4 x + \log_4 y + 6 \log_4 z$

16) $\log_5 \left(\frac{7^3}{3} \right) = \log_5 7^3 - \log_5 3 = 3 \log_5 7 - \log_5 3$

Condense each expression to a single logarithm.

17) $\log_8 12 + \log_8 7 + 3 \log_8 11$
 $\log_8 (12 \cdot 7 \cdot 11^3)$

18) $6 \log_9 a + 2 \log_9 b$
 $\log_9 a^6 + \log_9 b^2 = \log_9 a^6 b^2$

19) $\log_2 11 + \frac{\log_2 3}{2} + \frac{\log_2 5}{2}$
 $\log_2 11 + \frac{1}{2} \log_2 3 + \frac{1}{2} \log_2 5 = \log_2 11 \sqrt{15}$

20) $15 \log_8 n - 5 \log_8 v$
 $\log_8 n^{15} - \log_8 v^5 = \log_8 \frac{n^{15}}{v^5}$

Solve each equation.

21) $\log_x 4p = \log_x (5p - 3)$
 $4p = 5p - 3$
 $-1p = -3$
 $p = 3$
 $\log_3 6x = 2$
 $3^2 = 6x$
 $9 = 6x$
 $x = \frac{3}{2}$

22) $\log (-m + 2) = \log -2m$
 $-m + 2 = -2m$
 $2 = -m$
 $m = -2$

23) $\log_6 3x^2 + \log_6 2 = 2$
 $\log_6 6x^2 = 2$
 $6x^2 = 6x$
 $x = 1$

24) $\log_8 3x^2 + \log_8 6 = 3$
 $\log_8 18x^2 = 3$
 $8^3 = 18x^2$
 $512 = 18x^2$
 $\frac{256}{9} = x^2$
 $x = \pm \frac{16}{3}$

25) $\log_3 6 + \log_3 4x^2 = 2$
 $\log_3 24x^2 = 2$
 $3^2 = 24x^2$
 $9 = 24x^2$
 $x^2 = \frac{3}{8}$
 $x = \pm \sqrt{\frac{3}{8}} = \pm \frac{\sqrt{6}}{4}$

26

26) $\log_3 5x - \log_3 2 = 4$
 $\log_3 \frac{5x}{2} = 4$
 $3^4 = \frac{5x}{2}$
 $81 = \frac{5x}{2}$
 $162 = 5x$
 $\frac{162}{5} = x$

Answers to Logarithm and Exponential Practice

- 1) -3
- 2) $\frac{1}{2}$
- 3) 5
- 4) 3
- 5) 3
- 6) -4
- 7) 5
- 8) 3
- 9) $x^2 = y$
- 10) $10^{-3} = \frac{1}{1000}$
- 11) $7^n = 103$
- 12) $a^b = 70$
- 13) $30 \log_3 2 - 6 \log_3 5$
- 14) $3 \log_3 a + 4 \log_3 b$
- 15) $\log_4 x + \log_4 y + 6 \log_4 z$
- 16) $15 \log_5 7 - 5 \log_5 3$
- 17) $\log_8 (84 \cdot 11^3)$
- 18) $\log_9 (b^2 a^6)$
- 19) $\log_2 (11\sqrt{15})$
- 20) $\log_8 \frac{11^{15}}{y^3}$
- 21) {3}
- 22) {-2}
- 23) {6}
- 24) $\left\{ \frac{16}{3}, -\frac{16}{3} \right\}$
- 25) $\left\{ \frac{\sqrt{6}}{4}, -\frac{\sqrt{6}}{4} \right\}$
- 26) $\left\{ \frac{162}{5} \right\}$
- 27) {12, -12}
- 28) $\left\{ \frac{170}{33} \right\}$
- 29) {13, -13}
- 30) {4, -4}
- 31) {-1}
- 32) {0}
- 33) $\left\{ -\frac{1}{2} \right\}$
- 34) $\left\{ -\frac{3}{2} \right\}$
- 35) {1}
- 36) $\left\{ \frac{3}{2} \right\}$
- 37) -0.1247
- 38) -1.2668
- 39) 0.2042
- 40) -0.2073
- 41) -0.0377
- 42) -0.8504

- 28) $\log_5 x - \log_5 (x-5) = \log_5 34$
 $\log_5 \frac{x}{x-5} = \log_5 34$
 $\frac{x}{x-5} = 34$
 $x = 34(x-5)$
 $x = 34x - 170$
 $-33x = -170$
 $x = \frac{170}{33}$
- 30) $\log_8 (x^2 + 8) - \log_8 3 = 1$
 $\log_8 \frac{x^2 + 8}{3} = 1$
 $\frac{x^2 + 8}{3} = 8$
 $x^2 + 8 = 24$
 $x^2 = 16$
 $x = \pm 4$
- 32) $4^{-2x} = 4^{-2x}$
 $-3x = -2x$
 $x = 0$
- 34) $6^{2x} = 216$
 $6^{2x} = 6^3$
 $2x = 3$
 $x = \frac{3}{2}$
- 36) $\frac{36^{2x}}{36^x} = 6^3$
 $36^x = 6^3$
 $2x = 3$
 $x = \frac{3}{2}$
- 39) $9^{3p} \cdot 81^p = \frac{1}{9}$
 $9^{3p} \cdot 9^{2p} = 9^{-1}$
 $9^{5p} = 9^{-1}$
 $5p = -1$
 $p = -\frac{1}{5}$
- 38) $5^{-2m} - 3 = 56$
 $5^{-2m} = 59$
 $\log_5 5^{-2m} = \log_5 59$
 $-2m = \log_5 59$
 $-2m = 2.5535$
 $-10r = 2.5729$
 $r = -0.2573$
- 42) $-3 \cdot 7^{5b+6} - 8 = -98$
 $-3 \cdot 7^{5b+6} = -90$
 $7^{5b+6} = 30$
 $\log_7 7^{5b+6} = \log_7 30$
 $5b+6 = 1.7179$
 $5b = -4.2821$
 $b = -0.8564$
- 27) $\log_9 9^{n+2} = \log_9 38.45$
 $9^{n+2} = 38.45$
 $\log_9 9^{n+2} = \log_9 38.45$
 $n+2 = 1.6609$
 $n = -0.3391$

Solve each equation. Round your answers to the nearest ten-thousandth.

- 41) $-2 \cdot 9^{n+2} + 6.9 = -70$
 $-2 \cdot 9^{n+2} = -76.9$
 $9^{n+2} = 38.45$
 $\log_9 9^{n+2} = \log_9 38.45$
 $n+2 = 1.6609$
 $n = -0.3391$
- 37) $-8 \cdot 15^{-7n} = -85$
 $15^{-7n} = 10.625$
 $\log_{15} 15^{-7n} = \log_{15} 10.625$
 $-7n = 0.9127$
 $8x = 1.6225$
 $\log_8 8^{5x} = \log_8 43$
 $5x = 0.2042$
- 38) $5^{-2m} - 3 = 56$
 $5^{-2m} = 59$
 $\log_5 5^{-2m} = \log_5 59$
 $-2m = \log_5 59$
 $-2m = 2.5535$
 $-10r = 2.5729$
 $r = -0.2573$
- 40) $-4 \cdot 3^{-10r} = -39$
 $3^{-10r} = 9.75$
 $\log_3 3^{-10r} = \log_3 9.75$
 $-10r = 0.2073$
 $r = -0.02073$

You will need to know the Infinite Geometric Sum formula! $S = \frac{a_1}{1-r}; -1 < r < 1$

- 1) In the first year, the tuition at a local college is \$4,000. If the tuition increases by \$600 per year, how much will tuition be in the tenth year?
- A. \$10,600
 B. \$10,000
 C. \$ 9,400
 D. \$ 8,800

$$a_n = a_1 + (n-1)d$$

$$a_{10} = 4000 + (10-1)600$$

$$a_{10} = 9400$$

- 2) Evaluate $\sum_{k=1}^{10} (7-2x)$.
- A. -8
 B. -13
 C. -40
 D. -80

Calculator

- 3) The first term of an arithmetic sequence is -15, and the constant difference is d_1 . The first term of another arithmetic sequence is 75, and its constant difference is d_2 . If the 10th terms of both sequences are the same, what must be true about d_1 and d_2 ?
- A. $d_1 - d_2 = 10$
 B. $d_1 - d_2 = 9$
 C. $d_1 + d_2 = 10$
 D. $d_1 + d_2 = 9$

$$a_{10} = -15 + (10-1)d_1$$

$$a_{10} = 75 + (10-1)d_2$$

$$-15 + 9d_1 = 75 + 9d_2$$

$$9(d_1 - d_2) = 90$$

$$d_1 - d_2 = 10$$

- 4) An arithmetic sequence has a constant difference of 3b and a first term of y. The n th term has a value of 24. What is the value of n ?
- A. $\frac{24-y}{3b}$
 B. $\frac{24-y}{3b} + 1$
 C. $\frac{1}{3b} (\log \frac{24}{y})$
 D. $\frac{1}{3b} (\log \frac{24}{y}) + 1$

$$24 = y + (n-1)3b$$

$$24 - y = (n-1)3b$$

$$\frac{24-y}{3b} = n-1$$

$$\frac{24-y}{3b} + 1 = n$$

- 5) In a geometric sequence where $a_1 = 15$ and $a_5 = 240$, what is the first term in the sequence the is a multiple of 4?
- A. $a_2 = 20$
 B. $a_3 = 60$
 C. $a_4 = 60$
 D. $a_4 = 120$

$$a_n = a_1(r^{n-1})$$

$$240 = 15r^{5-1}$$

$$16 = r^4$$

$$r = 2$$

- 6) On the first of every month, a new library receives a new shipment of 575 book titles. If the library starts the beginning of the first year with 3,000 book titles and does receive a shipment that month, how many book titles will it have at the end of 3 years?
- A. 42,900
 B. 23,700
 C. 5,363
 D. 4,150

$$a_n = 3000$$

$$a_1 = 3575$$

$$a_n = 3575 + (n-1)575$$

$$a_{36} = 3575 + 35(575)$$

$$= 23,700$$

- 7) In her garden, Ginny is creating a brick mosaic in a trapezoidal shape. The mosaic pattern has 6 rows. The first row has 8 bricks, and the last row has 24 bricks. Given that Ginny's pattern follows an arithmetic sequence, how many bricks does she need?
- (Note: Partial bricks are allowed.)
- A. 112
 B. 96
 C. 64
 D. 38

$$S_n = \frac{n}{2} (a_1 + a_n)$$

$$= \frac{6}{2} (8 + 24)$$

$$= 3(32) = 96$$

- 8) Aidan and Fenny are each creating a trapezoidal brick patio in their gardens. In total, Aidan uses twice the number of bricks that Fenny uses. The first row of Fenny's pattern has 9 bricks. The last row in Fenny's pattern has 25 bricks, with n rows. Given that this pattern follows an arithmetic sequence, how many bricks are in Aidan's garden?
- A. $2n$
 B. $17n$
 C. $34n$
 D. $68n$

$$a_n = 2 \times \text{as many}$$

$$17n \cdot 2 = 34n$$

- 10) What is the sum of the arithmetic sequence x, y, z in terms of x and y ?
- A. $3y$
 B. $x + y + \frac{y^2}{x}$
 C. $2y - x$
 D. y^2

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

$$2(x+y+z) = 3y$$

$$2x + 2y + 2z = 3y$$

$$2x + 2z = y$$

$$2z = y - 2x$$

$$z = \frac{y-2x}{2}$$

$$x + y + \frac{y-2x}{2}$$

- 12) Evaluate $\sum_{n=1}^{20} (n^2 + 2)$.
- A. 216,285
 B. 213,240
 C. 211,909
 D. 25,669

Calculator

- 9) A career advisor tells Ming that a financial consultant earns \$43,000 for the first year, and there is a 3% annual pay raise. If Ming takes a job as a financial consultant, what will be her highest annual salary after working a total of 35 years?
- A. \$ 86,800
 B. \$ 89,150
 C. \$117,472
 D. \$120,996

$$a_n = a_1(r^{n-1})$$

$$a_{35} = 43,000(1.03)^{34}$$

$$= 117,471.93$$

- 11) Harold is starting a new workout program in which each day he will complete 4 more push-ups than the day before. If he starts with 5 push-ups on the 1st day, how many push-ups will he do on the 12 day?
- A. 44
 B. 48
 C. 49
 D. 53

$$a_n = 5 + (n-1)4$$

$$a_{12} = 5 + (12-1)4$$

$$= 5 + 44$$

$$= 49$$

- 13) The starting salary for a teacher in one school district is \$32,000. He receives the same percentage raise each year and makes \$38,036 during his eighth year. To the nearest tenth of a percent, what is the rate of increase of his salary each year?
- A. 2.0%
 B. 2.4%
 C. 2.5%
 D. 2.7%

$$38,036 = 32,000(1+r)^7$$

$$(1.1867)^7 = 1+r$$

$$1.025 = 1+r$$

$$r = 0.025$$

- 14) Given an arithmetic sequence in which $a_1 = 3$, $a_5 = 19$, and $a_n = 183$, what is n ?
- A. 38
 B. 39
 C. 40
 D. 41

$$19 = 3 + (5-1)d$$

$$16 = 4d$$

$$d = 4$$

- 15) A total of \$9,100 in prizes is awarded to the top 8 entries in a science project contest. The highest prize is \$2,000. The differences between successive prizes are equal. What is the amount, in dollars, of the lowest prize?
- A. \$200
 B. \$275
 C. \$425
 D. \$650

$$S_n = 9100 \quad n=8$$

$$9100 = \frac{8}{2} (a_1 + 2000)$$

$$9100 = 4(a_1 + 2000)$$

$$2275 = a_1 + 2000$$

$$a_1 = 275$$

- Answers: 1. C 2. C 3. A 4. B 5. B 6. B 7. B 8. C 9. C 10. A 11. C 12. B 13. C 14. D 15. B

Circles

Use the information provided to write the standard form equation of each circle.

- 1) Center: (-6, 15)
Radius: 4

$$(x+6)^2 + (y-15)^2 = 16$$

- 2) Center: (-16, -15)
Radius: 1

$$(x+16)^2 + (y+15)^2 = 1$$

- 3) Center: (14, -4)
Radius: 2

$$(x-14)^2 + (y+4)^2 = 4$$

- 4) Center: (12, -4)
Radius: 5

$$(x-12)^2 + (y+4)^2 = 25$$

- 7) Center: (13, 12)
Point on Circle: (9, 12)

$$r = 4$$

$$(x-13)^2 + (y-12)^2 = 16$$

- 8) Center: (9, 6)
Point on Circle: (15, 6)

$$r = 6$$

$$(x-9)^2 + (y-6)^2 = 36$$

- 9) Center: (6, -8)
Point on Circle: (12, -8)

$$r = 6$$

$$(x-6)^2 + (y+8)^2 = 36$$

- 10) Center: (11, -15)
Point on Circle: (8, -13)

$$r = \sqrt{13}$$

$$d = \sqrt{(11-8)^2 + (-15+13)^2}$$

$$d = \sqrt{9+4} = \sqrt{13}$$

$$(x-11)^2 + (y+15)^2 = 13$$

- 11) $x^2 + y^2 + 8x + 20y + 80 = 0$

$$x^2 + 8x + 16 + y^2 + 20y + 100 = 116$$

$$(x+4)^2 + (y+10)^2 = 116$$

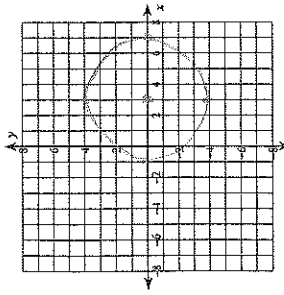
- 12) $x^2 + y^2 - 20x - 26y + 233 = 0$

$$x^2 - 20x + 100 + y^2 - 26y + 169 = 330$$

$$(x-10)^2 + (y-13)^2 = 330$$

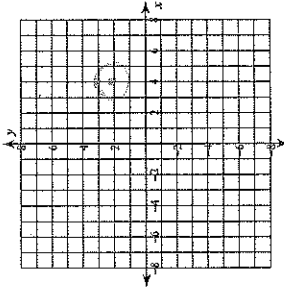
Identify the center and radius of each. Then sketch the graph.

- 5) $(x-3)^2 + y^2 = 16$



C: (3, 0)
r = 4

- 6) $(x-4)^2 + (y-2)^2 = 1$



C: (4, 2)
r = 1

- 13) $x^2 + y^2 + 26x - 4y + 164 = 0$

$$x^2 + 26x + 169 + y^2 - 4y + 4 = 9$$

$$(x+13)^2 + (y-2)^2 = 9$$

- 14) $x^2 + y^2 - 2x + 14y + 1 = 0$

$$x^2 - 2x + 1 + y^2 + 14y + 49 = 49$$

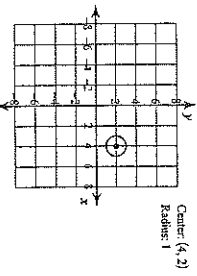
$$(x-1)^2 + (y+7)^2 = 49$$

Answers to Circles

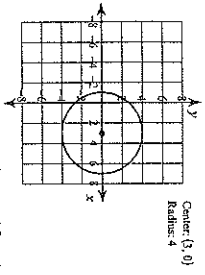
1) $(x+6)^2 + (y-15)^2 = 16$
 4) $(x-12)^2 + (y+4)^2 = 25$

2) $(x+16)^2 + (y+15)^2 = 1$
 5) $(x-13)^2 + (y-12)^2 = 16$

3) $(x-14)^2 + (y+4)^2 = 4$



8) $(x-9)^2 + (y-6)^2 = 36$
 11) $(x+4)^2 + (y+10)^2 = 36$
 14) $(x-1)^2 + (y+7)^2 = 49$



9) $(x-6)^2 + (y+8)^2 = 36$
 12) $(x-10)^2 + (y-13)^2 = 36$

10) $(x-11)^2 + (y+15)^2 = 13$
 13) $(x+13)^2 + (y-2)^2 = 9$

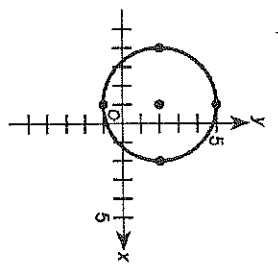
EOC Practice Problems - Circles

1) What is the equation of the circle with center (3, -6) and radius $\frac{15}{8}$?

- A. $(x-3)^2 + (y+6)^2 = \frac{225}{64}$
- B. $(x-3)^2 + (y+6)^2 = \frac{15}{8}$
- C. $(x+3)^2 + (y-6)^2 = \frac{225}{64}$
- D. $(x+3)^2 + (y-6)^2 = \frac{15}{8}$

$(\frac{15}{8})^2 = \frac{225}{64}$

2) What is the equation of this circle?



- A. $(x+1)^2 + (y-2)^2 = 6$
- B. $(x-1)^2 + (y+2)^2 = 6$
- C. $(x+1)^2 + (y-2)^2 = 9$
- D. $(x-1)^2 + (y+2)^2 = 9$

3) This is the equation of a parabola:

$y = -2x^2 + 4x + 2$

Determine the x-value for the vertex and whether this value is a maximum or a minimum.

- A. Maximum at $x = 1$
- B. Maximum at $x = 2$
- C. Minimum at $x = 1$
- D. Minimum at $x = 2$

$-\frac{4}{2(-2)} = -\frac{4}{-4} = 1$

4) What is the standard form of this equation of a circle?

$3x^2 + 3y^2 - 6x + 18y + 18 = 0$

- A. $(x-1)^2 + (y+3)^2 = 4$
- B. $(x+1)^2 + (y-3)^2 = 4$
- C. $(x-2)^2 + (y+6)^2 = 34$
- D. $(x+2)^2 + (y-6)^2 = 34$

$3x^2 - 6x + 3y^2 + 18y + 18 = 0$
 $3(x^2 - 2x + 1) + 3(y^2 + 6y + 9) = -18$
 $3(x-1)^2 + 3(y+3)^2 = -18$
 $(x-1)^2 + (y+3)^2 = -6$

5) A circle with equation $x^2 + y^2 = 37$ has center (0,0). The circle is shifted 3 units to the right and 4 units down. What is the equation of the new circle?

- A. $(x+4)^2 + (y-3)^2 = 37$
- B. $(x-4)^2 + (y+3)^2 = 37$
- C. $(x+3)^2 + (y-4)^2 = 37$
- D. $(x-3)^2 + (y+4)^2 = 37$

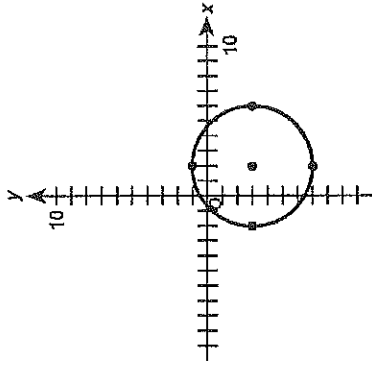
$(x-3)^2 + (y+4)^2 = 37$

6) What is the standard form of the equation for a circle with center (2, -3) and area of 16π ?

- A. $(x-2)^2 + (y+3)^2 = 4$
- B. $(x+2)^2 + (y-3)^2 = 4$
- C. $(x-2)^2 + (y+3)^2 = 16$
- D. $(x+2)^2 + (y-3)^2 = 16$

$(x-2)^2 + (y+3)^2 = 16$

8) Find the equation of this circle.



7) Find the center and radius of the circle with equation $x^2 - 4x + y^2 + 6y = 23$.

- A. Center: (-2,3); radius: 6
- B. Center: (2,-3); radius: 6**
- C. Center: (-2,3); radius: 36
- D. Center: (2,-3); radius: 36

$x^2 - 4x + y^2 + 6y = 23$
 $(x-2)^2 + (y+3)^2 = 36$

- A. $(x-2)^2 + (y+3)^2 = 4$
- B. $(x-2)^2 - (y+3)^2 = 4$
- C. $(x-2)^2 + (y+3)^2 = 16$**
- D. $(x-2)^2 - (y+3)^2 = 16$

Answers

- 1) A
- 2) C
- 3) A
- 4) A
- 5) D
- 6) C
- 7) B
- 8) C

1) What is the equation of the circle with center (3, -6) and radius $\frac{5}{8}$?

- A. $(x-3)^2 + (y+6)^2 = \frac{25}{64}$**
- B. $(x-3)^2 + (y+6)^2 = \frac{15}{8}$
- C. $(x+3)^2 + (y-6)^2 = \frac{25}{64}$
- D. $(x+3)^2 + (y-6)^2 = \frac{15}{8}$

Repeat question
See p. 31 #1

2) The equation $\frac{(x-4)^2}{c^2} + \frac{(y-6)^2}{d^2} = 36$ describes an ellipse with the center at (4,6), a vertical major axis with a length of 6, and a horizontal minor axis with a length of 4. What are the values of c and d?

- A. $c = 2$ and $d = 3$
- B. $c = 3$ and $d = 2$
- C. $c = \frac{1}{2}$ and $d = \frac{1}{3}$
- D. $c = \frac{1}{3}$ and $d = \frac{1}{2}$**

$\frac{(x-4)^2}{3c^2} + \frac{(y-6)^2}{3d^2} = 1$
 $3cd^2 = (6d)^2$
 $12d = 6 \rightarrow d = \frac{1}{2}$

3) What are the x-intercepts of the ellipse with equation $9x^2 + 4y^2 = 36$?

- A. 2, -2**
- B. 3, -3
- C. 4, -4
- D. 6, 0

$\frac{9x^2}{36} + \frac{4y^2}{36} = 1$
 $\frac{x^2}{4} + \frac{y^2}{9} = 1$

4) The equation $5x^2 + 4y^2 = 180$ represents what conic section?

- A. Circle
- B. Ellipse**
- C. Hyperbola
- D. Parabola

$\frac{5x^2}{180} + \frac{4y^2}{180} = 1$
 $\frac{x^2}{36} + \frac{y^2}{45} = 1$

5) What conic section does this equation represent, and what is its center?

- A. Hyperbola with center at (2, -1)
- B. Hyperbola with center at (-2, 1)**
- C. Ellipse with center at (2, -1)
- D. Ellipse with center at (-2, 1)

$\frac{(x+2)^2}{9} - \frac{(y-1)^2}{10} = 1$

6) What is the standard form of the equation $25x^2 + y^2 + 100x - 2y + 76 = 0$?

- A. $(x+2)^2 + \frac{(y-1)^2}{25} = 1$
- B. $(x+2)^2 + \frac{(y+1)^2}{6} = 1$
- C. $(x+2)^2 + \frac{(y-1)^2}{25} = 1$**
- D. $(x+2)^2 + \frac{(y+1)^2}{25} = 1$

$25x^2 + 100x + y^2 - 2y = -76$
 $25(x^2 + 4x + 4) + y^2 - 2y + 1 = 25$
 $\frac{25(x+2)^2}{25} + \frac{(y-1)^2}{25} = \frac{25}{25}$
 $(x+2)^2 + \frac{(y-1)^2}{25} = 1$

Answers

- 1) A
- 2) D
- 3) A
- 4) B
- 5) B
- 6) C

1) Richard has 5 shirts, 6 pairs of jeans, and 3 vests. How many different outfits, each composed of a shirt, a pair of jeans, and a vest, can he make?

- A. 6
B. 14
C. 33
D. 90

$5 \cdot 6 \cdot 3$

2) A math teacher has 20 students. She randomly selects the names of 3 different students. The first student explains the first homework problem, the second student explains the second problem, and the third student explains the third problem. In how many ways can the teacher assign these 20 students to the 3 problems?

- A. $\frac{20!}{3!}$
B. $\frac{20!}{17!}$
C. $\frac{20!}{(17!)(3!)}$
D. $\frac{20!}{17!+3!}$

${}_{20}P_3 = \frac{20!}{(20-3)!} = \frac{20!}{17!}$

3) A standard deck of playing cards has 52 cards. The deck has the same number of black and red cards and has 4 Jacks, two red and two black. What is the probability of randomly picking a Jack or a red card from a standard deck?

- A. $\frac{30}{52}$
B. $\frac{28}{52}$
C. $\frac{4}{52}$
D. $\frac{2}{52}$

$\frac{4}{52} + \frac{26}{52} - \frac{2}{52} = \frac{28}{52}$

4) Yi has a bag of 15 stones: 8 blue and 7 purple and randomly chooses 3 stones from the bag. If Yi picks 2 blue stones and does not return them to the bag, what is the probability that she will pick a purple stone next?

- A. $\frac{7}{15}$
B. $\frac{6}{15}$
C. $\frac{7}{13}$
D. $\frac{6}{13}$

5) Ten students will participate in a spelling contest. How many outcomes for first, second, and third place are possible?

- A. 30
B. 90
C. 120
D. 720

${}_{10}P_3 = 720$

6) The yearbook staff includes 8 photographers. On photographer needs to cover a dance, and another needs to cover a basketball game. In how many ways can photographers be assigned to these events?

- A. 16
B. 28
C. 56
D. 64

${}_{8}P_2 = 56$

7) Guests at a wedding reception must choose 1 food item from each of these 3 categories.

- Main Dish Entree: steak, fish, chicken
Vegetable: carrots, green beans, potatoes
Salad: garden, Caesar

How many different dinner combinations are possible?

- A. 8
B. 18
C. 56
D. 336

$3 \cdot 3 \cdot 2$

9) A high school's enrollment is 27% juniors and 31% seniors. What is the probability that a student chosen at random from this high school will be a junior or a senior?

- A. $\frac{1}{25}$
B. $\frac{25}{100}$
C. $\frac{58}{100}$
D. $\frac{57}{100}$

$\frac{27}{100} + \frac{31}{100} = \frac{58}{100}$

11) Karen's class has collected 96 small plastic animals offered as prizes in cereal boxes. Karen observes that 1 prize in 6 is a plastic horse. Her friend Conrad notices that 1 prize in 4 is red. If it can be determined, how many prizes are either red or a horse (or both)?

- A. 36
B. 40
C. 48
D. The probability cannot be determined from this information.

ANSWERS

1. D
2. B
3. B
4. C
5. D
6. C
7. B
8. A
9. C
10. B
11. D

8) A company assigns passwords to each of its 2000 employees. Each password consists of 3 distinct letters (no repeating letters) and 3 distinct digits. The company assigns a new password to each employee at the beginning of each month. To the nearest year, for how many years will the company be able to supply unique passwords?

- A. 468
B. 732
C. 5,616
D. 8,788

${}_{26}P_3 \times 10^3 = 21,000$
 $\frac{21,000}{12} = 1,750$
 $1,750 \times 12 = 21,000$

10) Box A contains marbles: 12 red, 16 blue, 11 green and 5 yellow. Box B contains chips: 8 red, 7 green, 11 blue, and 1 yellow. If you randomly pick one item from each box, what is the probability that both items will be blue?

- A. $\frac{1}{10}$
B. $\frac{4}{27}$
C. $\frac{50}{77}$
D. $\frac{700}{77}$

$\frac{16}{44} \cdot \frac{11}{27} = \frac{4}{27}$
 $4 \cdot \frac{1}{27} = \frac{4}{27}$

$\frac{1}{6}$ horse
 $\frac{1}{4}$ red

