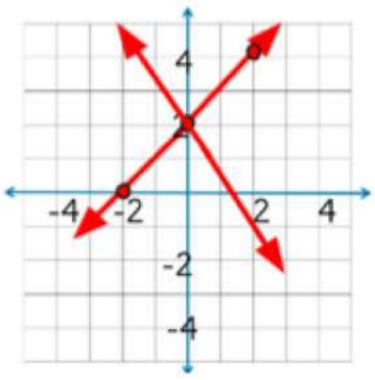
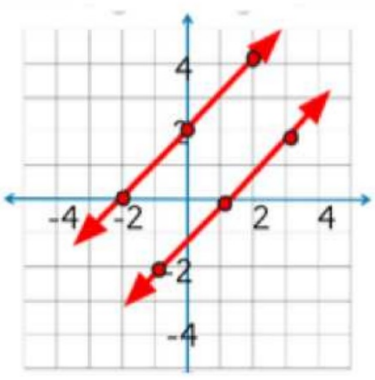
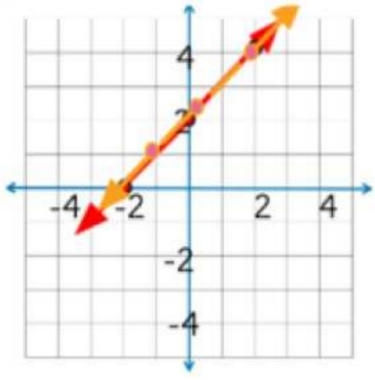
2x2 Systems of Equations & Inequalities







*See printout.

$-4y - 11x = 36$

$20 = -10x - 10y$

$-4 \mid 2 = -x - y$)

$36 = -11x - 4y$

$-8 = 4x + 4y$

$28 = -7x$

$-4 = x$

$-8 = 4x + 4y$

$-8 = 4(-4) + 4y$

$8 = 4y$

$2 = y$

$(-4, 2)$

$$3x+y=7$$
$$-(3x+y=4)$$

$$3x+y=7$$
$$-3x-y=-4$$

$$0 \neq 3$$

$$\emptyset$$

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

$$4x-6y=12$$
$$-4x+6y=-12$$

$$0=0$$

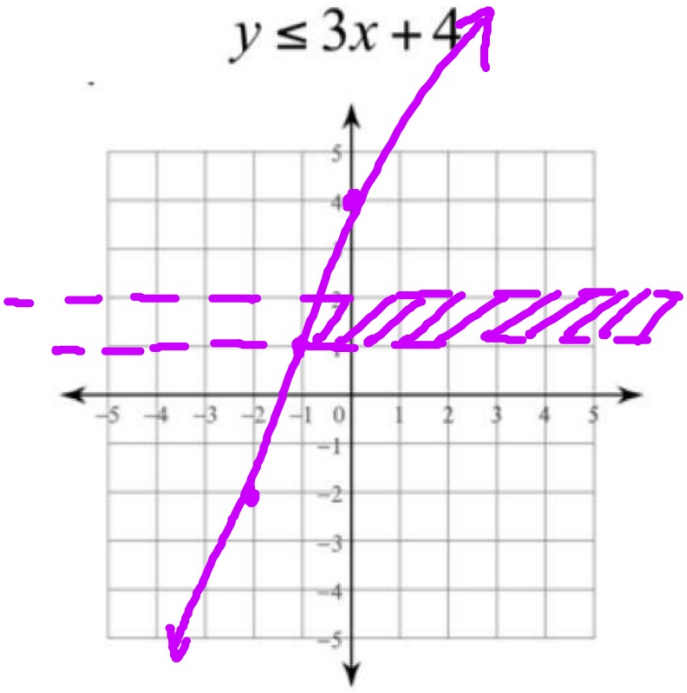
infinitely many

ex: Solve the system graphically.

d)

$$1 < y < 2$$

$$y \leq 3x + 4$$



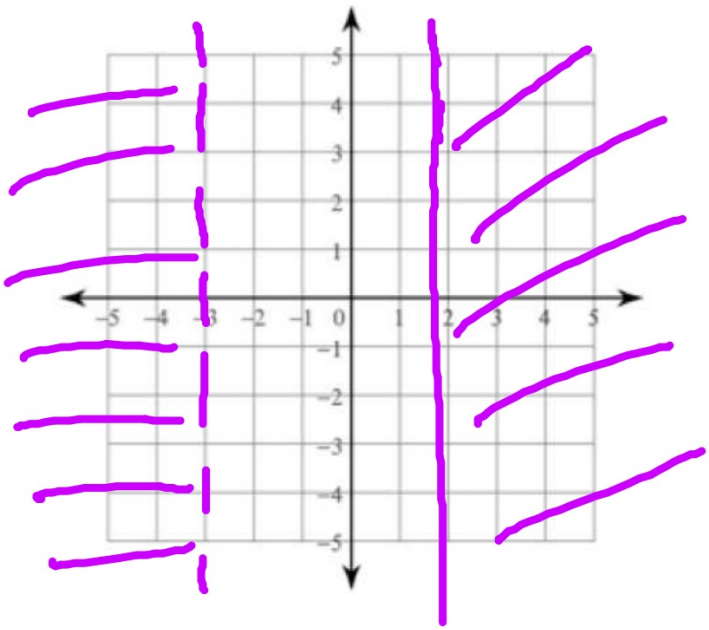
ex: Solve the system graphically.

c)

$$x < -3$$

$$x \geq 2$$

$\emptyset$



ex: Solve the system graphically.

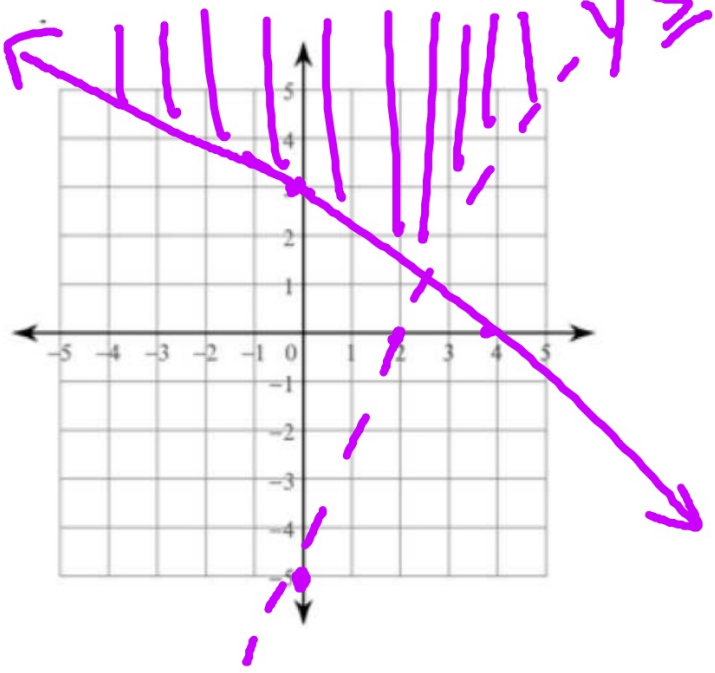
b)

$5x - 2y < 10$ → $y > \frac{5}{2}x - 5$

$3x + 4y \geq 12$ → $y \geq \frac{-3}{4}x + 3$

(0, -5)

(2, 0)



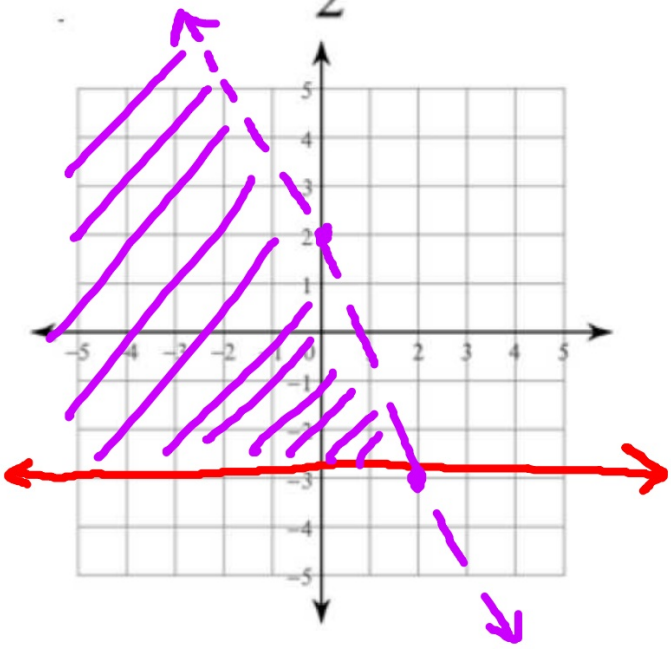
inequalities WS: odds

Cramer's rule wkst: 1 - 4 al

ex: Solve the system graphically.

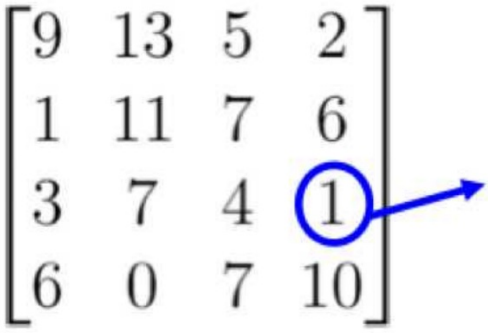
a) $y \geq -3$

$y < -\frac{5}{2}x + 2$



What is a Matrix?

A matrix is a rectangular array of variables or constants organized in rows and columns, enclosed by **brackets**. Each value in the matrix is referred to as an element.



The element 1 is in Row 3 and Column 4 and is depicted by the name a_{34}

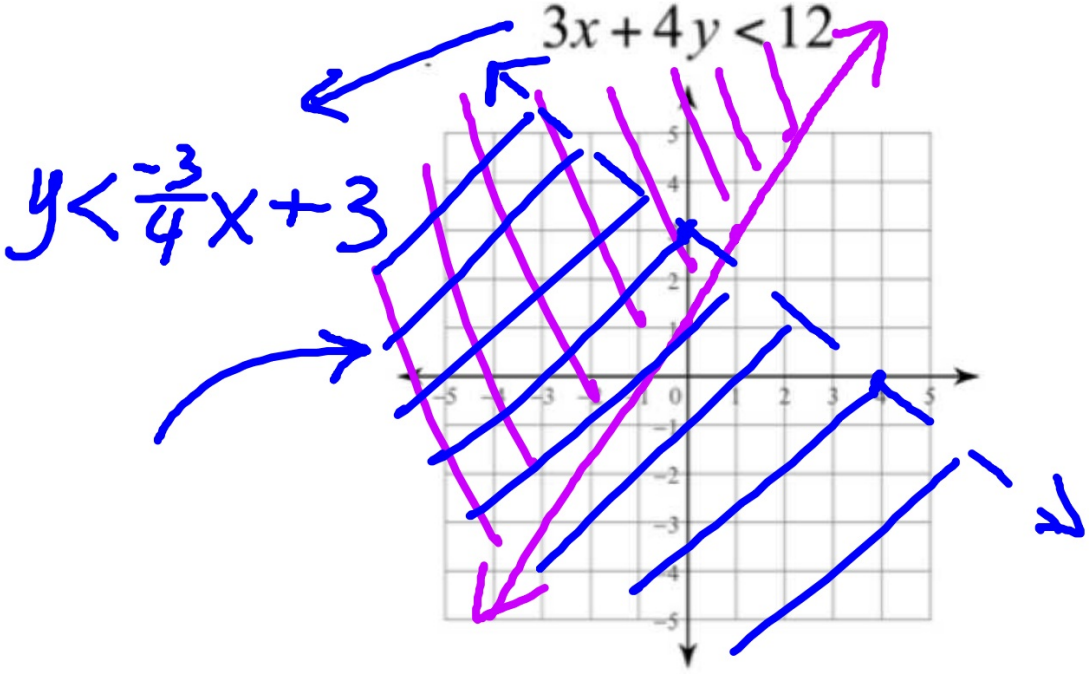
REVIEW

ex: Solve graphically.

$y \geq 2x + 1$

$3x + 4y < 12$

$y < \frac{-3}{4}x + 3$



REVIEW

ex: Solve algebraically.

$$8x - 6y = -20$$
$$-16x + 7y = 30$$

$2(8x-6y=-20)$

$16x-12y=-40$

$+\quad -16x+7y=30$

$-5y=-10$

$y=2$

$8x-12=-20$

$8x=-8$

$x=-1$

$(-1,2)$

REVIEW

ex: The admission fee at a small fair is $1.50 for children and $4.00 for adults. On a certain day, 2200 people enter the fair and $5050 is collected. How many children and how many adults attended?

a: adults

c: children

$1.5c + 4a = 5050$

$c + a = 2200$

$c = (2200 - a)$

$1.5(2200 - a) + 4a = 5050$

$3300 - 1.5a + 4a = 5050$

$2.5a = 1750$

$a = 700$ adults

$c = 1500$ children

2x2 systems of equations and inequalities

2x2 word problems

2x2 systems with Cramer's Rule

3x3 systems of equations

ex: Name the circled element.

a) $\begin{bmatrix} 9 & 13 & 5 & 2 \\ 1 & 11 & \textcircled{7} & 6 \\ 3 & 7 & 4 & 1 \\ 6 & 0 & 7 & 10 \end{bmatrix}$

row 2
column 3

b) $\begin{bmatrix} 9 & 13 & 5 & 2 \\ 1 & 11 & 7 & 6 \\ \textcircled{3} & 7 & 4 & 1 \\ 6 & 0 & 7 & 10 \end{bmatrix}$

row 3
column 1

Matrix Dimensions

A matrix is often described by its dimensions. A matrix with m rows and n columns is known as an "m x n matrix."

ex: State the dimensions of each matrix.

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

2×3 matrix

b) $\begin{bmatrix} 7 & 8 \\ 0.5 & -10 \end{bmatrix}$

2×2 matrix

Special Matrices

Row Matrix - one row

ex: $\begin{bmatrix} 1 & 2 \end{bmatrix}$

Column Matrix - one column

ex: $\begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix}$

Special Matrices

Square Matrix - same number of columns and rows

ex: $\begin{bmatrix} 7 & 8 \\ 0.5 & -10 \end{bmatrix}$

Zero Matrix - every element is zero

ex: $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

Determinants

A determinant is a matrix function that only accepts a **square matrix**.

Notation for the Determinant of Matrix A:

$$\det(A) \qquad |A| \qquad D_A$$

*The determinant of a 2x2 square matrix is called a **second-order determinant**.

*The determinant of a 3x3 square matrix is called a **third-order determinant**.

ex: Evalutate.

a) $\begin{vmatrix} 5 & -4 \\ 8 & 9 \end{vmatrix}$

$5 \cdot 9 - 8 \cdot -4$

$45 + 32$

77

ex: Evalutate.

b) $\begin{vmatrix} 0 & 6 \\ 4 & -11 \end{vmatrix}$

down - UP

$0 - (-24)$

$-(-24)$

Cramer's Rule

Cramer's Rule is an algebraic method for solving systems of equations using determinants of matrices.

ex: Solve the system using Cramer's Rule, if possible.

a) $x - 3y = 4$

$5x + 7y = 8$

$x = \frac{D_x}{D} = \frac{52}{22} = \frac{26}{11}$ $\quad y = \frac{D_y}{D} = \frac{-6}{11}$

$D = \begin{vmatrix} 1 & -3 \\ 5 & 7 \end{vmatrix} = 7 - (-15) = 22$

$D_x = \begin{vmatrix} 4 & -3 \\ 8 & 7 \end{vmatrix} = 28 + 24 = 52$

$D_y = \begin{vmatrix} 1 & 4 \\ 5 & 8 \end{vmatrix} = 8 - 20 = -12$

ex: Solve the system using Cramer's Rule, if possible.

a) $x - 3y = 4$ $\quad (-5)$

$5x + 7y = 8$

$-5x + 15y = -20$

$5x + 7y = 8$

$22y = -12$

$y = \frac{-12}{22}$

$x - 3\left(\frac{-6}{11}\right) = 4$

$x + \frac{18}{11} = 4$

$x = 4 - \frac{18}{11}$

$x = \frac{26}{11}$

ex: Solve the system using Cramer's Rule, if possible.

b) $7x - 7y = 8$

$-3x + 3y = 2$

no solution

$$D = \begin{vmatrix} 7 & -7 \\ -3 & 3 \end{vmatrix} = 21 - 21 = 0$$

ex: Solve the system using Cramer's Rule, if possible.

c) $4x - 3y = 11$

$6x + 5y = 7$

$\frac{Dx}{D} = 2$

$D = \begin{vmatrix} 4 & -3 \\ 6 & 5 \end{vmatrix} = 20 + 18 = 38$ $\frac{Dy}{D} = -1$

$Dx = \begin{vmatrix} 11 & -3 \\ 7 & 5 \end{vmatrix} = 55 + 21 = 76$

$Dy = \begin{vmatrix} 4 & 11 \\ 6 & 7 \end{vmatrix} = 28 - 66 = -38$

lane flying in the same direction of the wind travels 183 mph. If the s
to fly against the wind it would travel 141 mph. Find the speed of the
ir and the speed of the wind.

$p+w=183$

$p-w=141$

lane: 162 mph

ind: 21 mph

coin box of the hospital's vending machine contains only quarters a
e are 6 times as many quarters as dimes. If the total amount of mon
e day was $28.80, how many of each coin was in the box?

$.25Q+.10D=28.80$

$6D=Q$