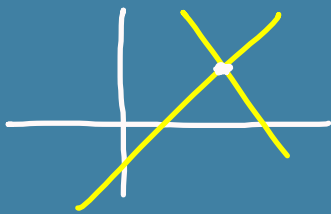
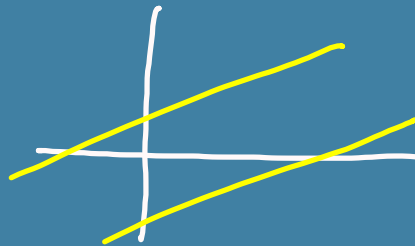


# SYSTEMS OF EQUATIONS

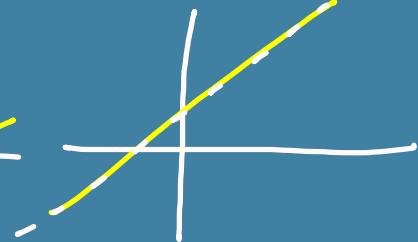
$$\begin{aligned} 2x + 3y &= 6 \\ x - 4y &= -9 \end{aligned}$$



1 solution  
different  
slopes



0 solutions  
Same slopes  
different  
intercepts



Infinitely many  
Same slopes  
same intercepts

Solution: Write eq. of line

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

How many  
solutions

$$6x - 9y = 17$$

$$m_1 = \frac{2}{3} \quad m_2 = \frac{+6}{+9} = \frac{2}{3}$$

$$y\text{-int}_1 = -5$$

$$y\text{-int}_2 = -\frac{17}{9}$$

parallel lines

0 solutions

$$\frac{0}{-17/9}$$

- 1) Elimination      3) Graphing (calculator)      5) Matrix Equations  
 2) Substitution      4) Cramer's Rule

## Elimination

$$\begin{array}{l} 4 \quad [2x - 5y = -22] \\ 5 \quad [3x + 1y = 13] \end{array}$$

$$\begin{array}{r} 8x - 20y = -88 \\ + 15x + 20y = 65 \\ \hline \end{array}$$

$$\frac{23x}{23} = -\frac{23}{23}$$

$$x = -1$$

$$2(-1) - 5y = -22$$

$$\begin{array}{r} -2 - 5y = -22 \\ +2 \quad +2 \end{array}$$

$$\frac{-5y}{-5} = \frac{-20}{-5}$$

$$y = 4$$

$$\boxed{(-1, 4)}$$

$$\begin{array}{l} \cancel{x = -1} \\ \cancel{y = 4} \end{array}$$

# SUBSTITUTION

$$\begin{cases} 2x - 5y = -22 \\ 3x + 4y = 13 \end{cases}$$

$$\frac{2x}{2} = \frac{5y - 22}{2}$$

$$x = \frac{5}{2}y - 11$$

$$3\left(\frac{5}{2}y - 11\right) + 4y = 13$$

$$\left[ \frac{15}{2}y - 33 + 4y = 13 \right]$$

$$15y - 66 + 8y = 26$$

$$\frac{23y}{23} = \frac{92}{23}$$

$$y = 4$$

1) Isolate one of the variables  
(Use variable with smallest coefficient.)

2) Substitute into other equation + solve for the remaining variable

$$x = \frac{5}{2}(4) - 11$$

$$x = 10 - 11$$

$$x = -1$$

$$\boxed{(-1, 4)}$$

Determinant - a square array of numbers enclosed between vertical lines

$$\begin{vmatrix} 2 & -5 \\ 3 & 8 \end{vmatrix} = \text{has a numerical value}$$

$$= 16 + 15 = \textcircled{31} \quad \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

$$\begin{vmatrix} -7 & 2 \\ 4 & 3 \end{vmatrix} = -21 - 8$$

$$= -29$$

### CRAMER'S RULE

$$2x - 5y = -22$$

$$3x + 4y = 13$$

$$x = \frac{\begin{vmatrix} = & y_1 \\ = & y_2 \end{vmatrix}}{\begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix}}$$

$$y = \frac{\begin{vmatrix} x_1 & = \\ x_2 & = \end{vmatrix}}{\begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix}}$$

$$x = \frac{\begin{vmatrix} -22 & -5 \\ 13 & 4 \end{vmatrix}}{\begin{vmatrix} 2 & -5 \\ 3 & 4 \end{vmatrix}} = \frac{-88 + 65}{8 + 15} = \frac{-23}{23} = -1$$

$$y = \frac{\begin{vmatrix} 2 & -22 \\ 3 & 13 \end{vmatrix}}{\begin{vmatrix} 2 & -5 \\ 3 & 4 \end{vmatrix}} = \frac{26 + 66}{23} = \frac{92}{23} = 4$$

$$\boxed{(-1, 4)}$$

## GRAPHING - (calculator)

$$8x + 20y = -200$$

$$800x - 55y = -40,550$$

1) Graph both lines

2) Change window to see intersection

3) Menu - Analyze  
- Intersection

Standard Form:

Menu - 3 - 3 - 1 - 3

Back to  $f_1(x)$ :

Menu - 3 - 1