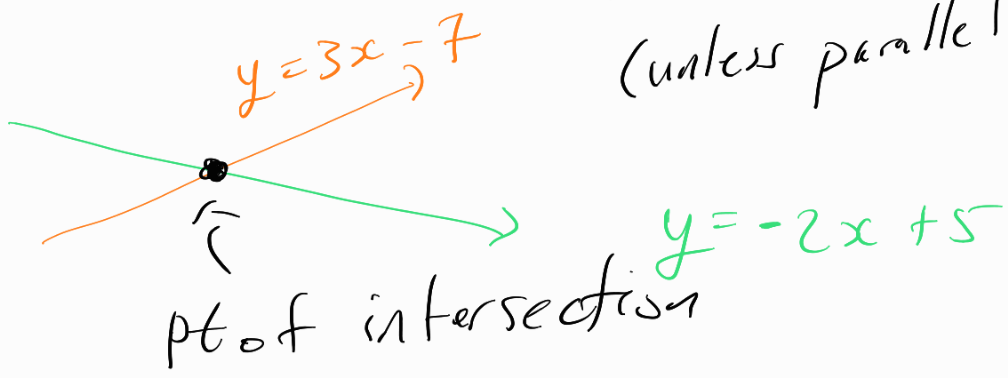
- lines $y = mx + b$

- more than 1 line: must intersect (unless parallel!)



system of eq. $\begin{cases} y = 3x - 7 \\ y = -2x + 5 \end{cases}$

- solving for x, y gives pt of intersection

methods

① sub ② elim ③ matrix row reduction

Game

GOAL

get to $\left[\begin{array}{cc|c} 1 & 0 & a \\ 0 & 1 & b \end{array}\right]$

3 rules

① swap row ok

#goals

$$\left[\begin{array}{cc|c} 1 & 2 & 5 \\ 3 & 4 & 6 \end{array}\right] \longrightarrow \left[\begin{array}{cc|c} 3 & 4 & 6 \\ 1 & 2 & 5 \end{array}\right]$$

① 1 in top left corner

② create a staircase

② multiply/divide rows w/ nonzero #

$$\left[\begin{array}{cc|c} 1 & 2 & 5 \\ 3 & 4 & 6 \end{array}\right] \xrightarrow{R_1 \cdot 4} \left[\begin{array}{cc|c} 4 & 8 & 20 \\ 3 & 4 & 6 \end{array}\right]$$

③ add/subtract row w/ another row

$$\left[\begin{array}{ccc|c} 1 & 2 & 3 & 0 \\ 4 & 5 & 6 & 1 \\ 7 & 8 & 9 & 2 \end{array}\right] \xrightarrow{R \to R_3 + R_1} \left[\begin{array}{ccc|c} 1 & 2 & 3 & 0 \\ 4 & 5 & 6 & 1 \\ 8 & 10 & 12 & 2 \end{array}\right]$$

Cramer's Rule uses determinants

converts

square matrices → a single #

$$\det\left(\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}\right) \checkmark$$

$$\det\left(\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}\right) \quad \times$$

one more row line

$\boxed{1 \times 1}$

$$\det([3]) = \boxed{3}$$

$$\det([-2023.754]) = \boxed{-2023.754}$$

$$\det\left(\left[\frac{2023}{2024}\right]\right) = \boxed{\frac{2023}{2024}}$$

$\boxed{2 \times 2}$

$$\det\left(\begin{bmatrix} a & b \\ c & d \end{bmatrix}\right) = \underline{ad} - \underline{bc}$$

$$\det\left(\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\right) = 1 \cdot 4 - 2 \cdot 3$$

$$= -2$$

$$\det\left(\begin{bmatrix} 2 & 0 \\ 2 & 3 \end{bmatrix}\right) = 6 - 0 = 6$$

$$\det\left(\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}\right) = 1 \cdot 1 - 1 \cdot 1 = 0$$

3x3 det

$$\det\left(\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}\right)$$

3 **STEPS**

1. copy & paste first 2 columns
2. Paste the 2 columns on right of matrix
3. Draw 3 diagonal lines up & down

a b c | a b

$$\begin{matrix} d & e & f & d & e \\ g & h & i & g & h \end{matrix}$$

$\det = a \cdot e \cdot i + bfg + cdh$
$\quad - gec - ahf - bdi$

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

$= 3 + 0 + 0$
$\quad - 0 - 0 - 0 = 3$

Cramer's rule on Mon