Dec 7

Matrices and Determinants

$$\det\begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{vmatrix} a & b \\ c & d \end{vmatrix} \quad ad - cb$$

$$\det\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} = \begin{vmatrix} 2 & 1 \\ 3 & 2 \end{vmatrix} \quad 2(2) - 3(1) \quad 4 - 3 \quad (1)$$

$$\det\begin{bmatrix} 2x & 1 \\ 3 & 2 \end{bmatrix} = \begin{vmatrix} 2x & 1 \\ 3 & 2 \end{vmatrix} \quad 2x(2) - 3(1) \quad (4x - 3)$$

$$\det\begin{bmatrix} -3 & -1 \\ -7 & -2 \end{bmatrix} = \begin{vmatrix} -3 & -1 \\ -7 & -2 \end{vmatrix} \quad -3(-2) - -7(-1) \quad 6 - 7 \quad (-1)$$

absolute value symbol does NOT mean absolute value, it means value, so answers can still be negative

Solving a system of equations with two variables - Cramer's Rule

Step 1: Find the coefficient matrix
Step 2: Substitute the constant terms for 'x' to solve for "x"
Step 3: Substitute the constant terms for 'y' to solve for 'y'

$$\begin{aligned} 3x - 2y &= 22 \\ x + 4y &= -2 \end{aligned}$$

(22 and −2: constant)

coefficient matrix $= \begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix}$ (x, y)

determinant $\begin{vmatrix} 3 & -2 \\ 1 & 4 \end{vmatrix} = 14$

$$x = \frac{\begin{vmatrix} 22 & -2 \\ -2 & 4 \end{vmatrix}}{14} = \frac{84}{14} = 6$$

determinant of $\begin{bmatrix} 22 & -2 \\ -2 & 4 \end{bmatrix}$

Switch x's with constants

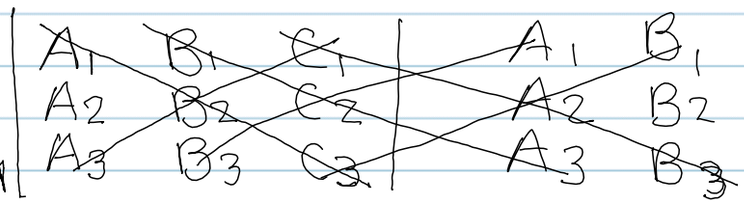
$$y = \frac{\begin{vmatrix} 3 & 22 \\ 1 & -2 \end{vmatrix}}{14} = \frac{-28}{14} = -2$$

Switch y's with constants

SOLUTION: (6, −2)

12/9/10
Honors Algebra 2
Pd. A3

Determinant of a 3 × 3 Matrix
• The Diagonal Method



Step 1: expand 1st two columns outside the brackets

Step 2: Draw diagonals to connect 3 entries per diagonal in the downward direction

$$A_1B_2C_3 + B_1C_2A_3 + C_1A_2B_3$$

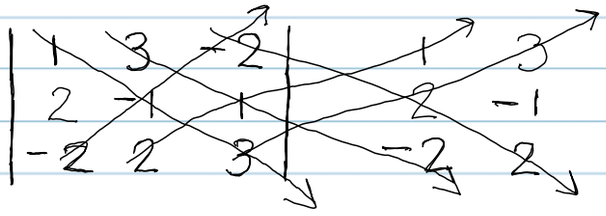
Step 3: Repeat step 2 in the upward direction

$$A_3B_2C_1 + B_3C_2A_1 + C_3A_2B_1$$

$$\downarrow$$

$$A_1B_2C_3 + B_1C_2A_3 + C_1A_2B_3 -$$

$$(A_3B_2C_1 + B_3C_2A_1 + C_3A_2B_1)$$



① $1(-1)(3) + 3(1)(-2) + -2(2)(2) -$ ← * distribute negative

② $-2(\overset{-4}{-1})(-2) + 2(\overset{2}{1})(1) + 3(\overset{18}{2})(3)$ → $4 - 2 - 18 = 16$

① $\boxed{-3-6-8} = -17 - 16 = \boxed{-33}$ ← Determinant

$$x + 2y - 3z = -2$$
$$x - y + z = -1$$
$$3x + 4y - 4z = 4$$

$$\det \rightarrow \begin{vmatrix} 1 & 2 & -3 \\ 1 & -1 & 1 \\ 3 & 4 & -4 \end{vmatrix} = -7$$

$$x = \frac{\begin{vmatrix} -2 & 2 & -3 \\ -1 & -1 & 1 \\ 4 & 4 & -4 \end{vmatrix}}{-7} = 0$$

$$y = \frac{\begin{vmatrix} 1 & -2 & -3 \\ 1 & -1 & 1 \\ 3 & 4 & 4 \end{vmatrix}}{-7} = 5$$

use graphing calculator to solve.