11/7/19

4.1 Matrix Operations

Matrix: rectangular arrangement of numbers in rows and columns.

Ex 1

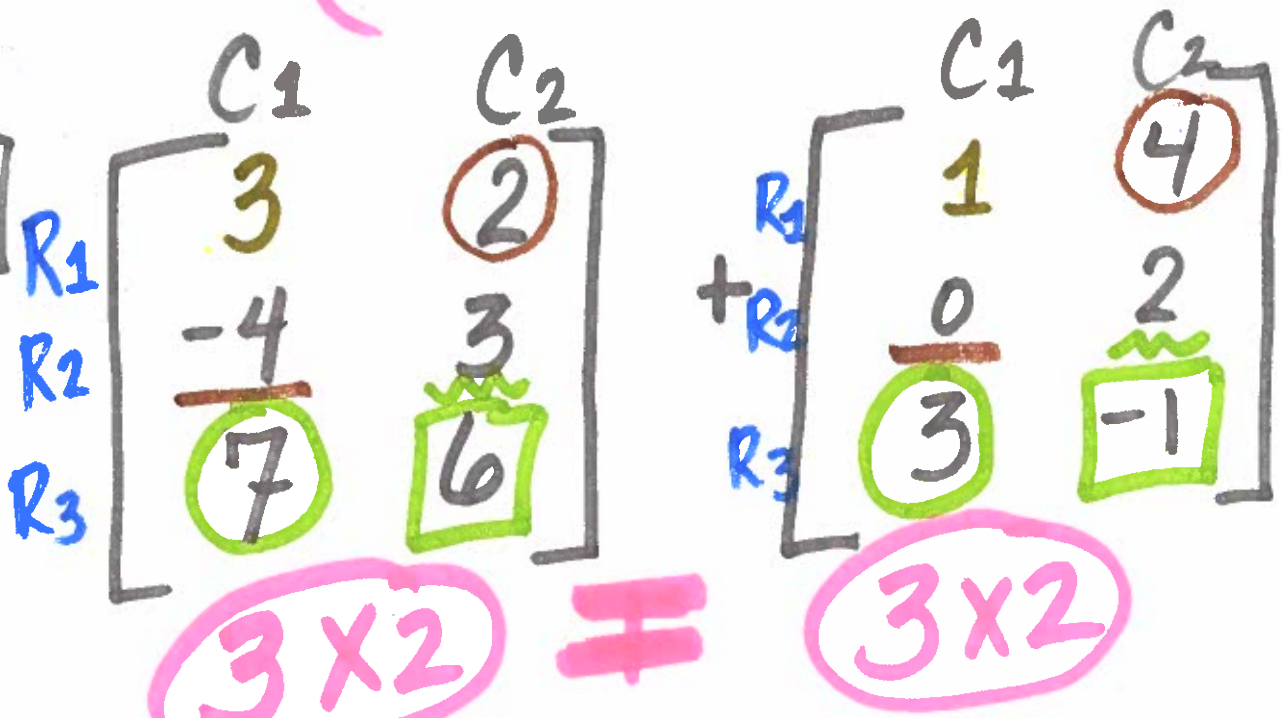
$$\begin{array}{c} \\ R_1 \\ R_2 \end{array}\begin{array}{c} \begin{array}{ccc} C_1 & C_2 & C_3 \end{array} \\ \begin{bmatrix} 6 & 2 & -1 \\ -2 & 0 & 5 \end{bmatrix} \end{array}$$

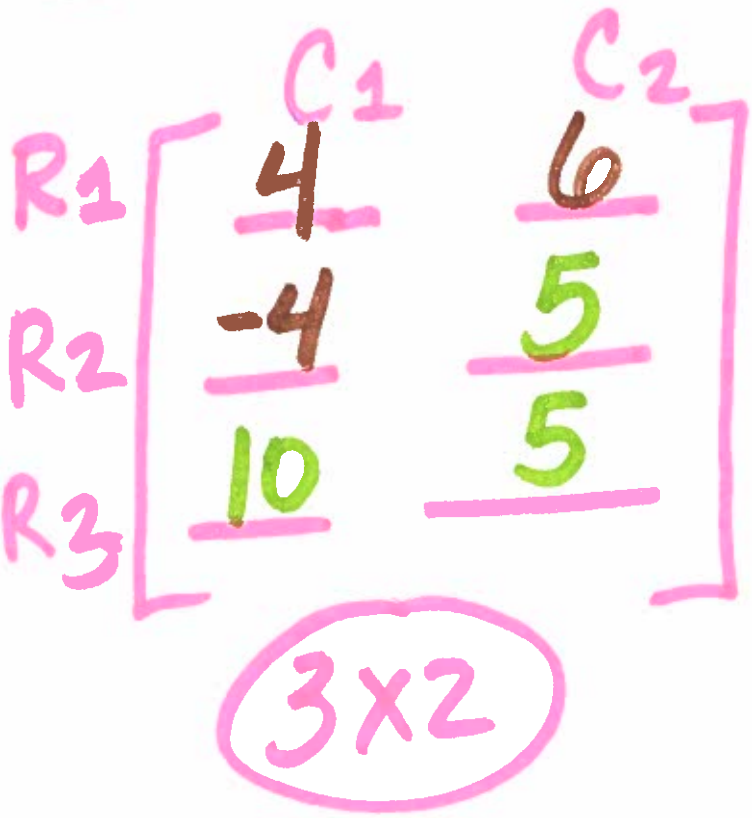
Rows x Columns

2 x 3

P1 Add / subtract (same dimensions)

ie 1





ic 2

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

3x2 — 3x2

$$\begin{array}{c} \\ R_1 \\ R_2 \\ R_3 \end{array} \begin{array}{c} \begin{array}{cc} C_1 & C_2 \end{array} \\ \begin{bmatrix} 2 & -2 \\ -4 & 1 \\ 4 & 7 \end{bmatrix} \end{array}$$

$6+1=7$

3x2

(P4) Scalar Multiplication: (dilation)

→ Multiply each number by a number outside the matrix.

ie 1

$$3\begin{bmatrix} -2 & 0 \\ 4 & -7 \end{bmatrix} = \begin{bmatrix} -6 & 0 \\ 12 & -21 \end{bmatrix}$$

$$\begin{bmatrix} -6 & 0 \\ 12 & -21 \end{bmatrix} + \begin{bmatrix} 1 & 1 \\ 2 & 2 \end{bmatrix}$$

$$\begin{bmatrix} -5 & 1 \\ 14 & -19 \end{bmatrix}$$

(P5) Solve for x & y (GEMDAS)

(x1)

$$2\left(\begin{bmatrix} 3x & -1 \\ 8 & 5 \end{bmatrix} + \begin{bmatrix} 4 & 1 \\ -2 & -y \end{bmatrix}\right) = \begin{bmatrix} 26 & 0 \\ 12 & 8 \end{bmatrix}$$

$$2\begin{bmatrix} (3x+4) & 0 \\ 6 & (5-y) \end{bmatrix} = \begin{bmatrix} 26 & 0 \\ 12 & 8 \end{bmatrix}$$

$$\begin{bmatrix} 6x+8 & 0 \\ 12 & 10-2y \end{bmatrix} = \begin{bmatrix} 26 & 0 \\ 12 & 8 \end{bmatrix}$$

$6x+8=26$

$-8 \quad -8$

$6x=18$

$\frac{6x}{6}=\frac{18}{6}$

$x=3$

$10-2y=8$

$-10 \quad -10$

$-2y=-2$

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

$y=1$

11/12/19 4.2 ALG2 Mult. Matrices

* Must have 2 numbers in the dimensions the same.

R : C same

(P1) Test if we can multiply

(ie1) $A\begin{bmatrix}1 & 3\\ 2 & 4\end{bmatrix}$ $B\begin{bmatrix}-3 & -1\\ -2 & 0\end{bmatrix}$

2 x (2) (2) x 2

same

yes

(ie2) A: 2x3
B: 3x4 yes

(ie3) A: 3x2 no
B: 3x4

(P2) Finding Product of 2 Matrices

$$A = \begin{matrix} R_1 \\ R_2 \\ R_3 \end{matrix}\begin{bmatrix} -2 & 3 \\ 1 & -4 \\ 6 & 0 \end{bmatrix} \qquad B = \begin{matrix} R_1 \\ R_2 \end{matrix}\begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$$

C_1 C_2 C_1 C_2

3×2 yes 2×4

	C1	C2
R1	$-2(-1) + 3(-2)$ $2 - 6 = -4$	$-2(3) + 3(4)$ $-6 + 12 = 6$
R2	$1(-1) + -4(-2)$ $-1 + 8$	$1(3) + -4(4)$ $3 - 16$
R3	$6(-1) + 0(-2)$ -6	$6(3) + 0(4)$ 18

	C1	C2
R1	-4	6
R2	7	-13
R3	-6	18

ic2

$$A\begin{bmatrix}3 & 2\\ -1 & 0\end{bmatrix} \qquad B=\begin{bmatrix}1 & -4\\ 2 & 1\end{bmatrix}$$

2×2 $\qquad$ 2×3

R x C

$(B\cdot A)$

$$B=\begin{array}{c} \\ R_1 \\ R_2\end{array}\begin{array}{c}\begin{matrix}C_1 & C_2\end{matrix}\\ \begin{bmatrix}1 & -4\\ 2 & 1\end{bmatrix}\end{array} \qquad A=\begin{array}{c}\\ R_1 \\ R_2\end{array}\begin{array}{c}\begin{matrix}C_1 & C_2\end{matrix}\\ \begin{bmatrix}3 & 2\\ -1 & 0\end{bmatrix}\end{array}$$

$$\begin{array}{c} \\ R_1 \\ R_2\end{array}\begin{array}{c}\begin{matrix}C1 & C2\end{matrix}\\ \begin{bmatrix}1(3)+-4(-1) & 1(2)+-4(0)\\ 3+4 & 2+0\\ 2(3)+1(-1) & 2(2)+1(0)\\ 6+-1 & 4+0\end{bmatrix}\end{array}$$

$$\begin{bmatrix}7 & 2\\ 5 & 4\end{bmatrix}$$

ie3 On calculator

$$A = \begin{bmatrix} +2 & 1 \\ -1 & 3 \end{bmatrix} \quad B = \begin{bmatrix} -2 & 0 \\ 4 & 2 \end{bmatrix}$$

2x2

AB

$$\begin{bmatrix} 0 & 2 \\ 14 & 6 \end{bmatrix}$$

1. 2ND matrix
2. Edit [A]
3. Fill in #'s
4. 2ND quit

Steps 1-4 [B]

9. 2ND matrix [A:] enter
10. 2ND matrix [B:] enter
11. enter

$$\begin{bmatrix} 0 & 1 & 0 \\ 6 & -3 & -1 \\ -2 & 5 & 3 \end{bmatrix} \begin{bmatrix} 5 & -7 & 4 \\ 3 & 12 & 6 \\ -4 & -5 & -12 \end{bmatrix}$$

$$\begin{bmatrix} 3 & 12 & 6 \\ 25 & -73 & 18 \\ -7 & 59 & -14 \end{bmatrix}$$

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#3-31 odds

11/20/19

4.3 Cramers Rule

→ use determinants to solve linear equations.

Determinants

Coefficient Matrix

Linear system

$$ax+by=e$$
$$cx+dy=f$$

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

Cramers Rule:

FORMULA:

$$x=\frac{\begin{bmatrix} e & b \\ f & d \end{bmatrix}}{\det A} \qquad y=\frac{\begin{bmatrix} a & e \\ c & f \end{bmatrix}}{\det A}$$

ie1 **Cramer's Rule**

$$8x + 5y = 2$$
$$2x - 4y = -10$$

(a) (b) (c) (d) (e) (f)

Step 1: find determinant $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$

$$\begin{bmatrix} 8 & 5 \\ 2 & -4 \end{bmatrix}$$

det A: (-42)

Step 1: Create matrix

Step 2: (2ND) (quit)

Step 3 (2ND) matrix

math

1: det(

Step 4: 2ND matrix

enter

Step 2 use Cramers Formula for (2x2)

$$x = \frac{\begin{vmatrix} e & b \\ f & d \end{vmatrix}}{\det A} \qquad y = \frac{\begin{vmatrix} a & e \\ c & f \end{vmatrix}}{\det A}$$

$$x = \frac{\begin{vmatrix} 2 & 5 \\ +10 & -4 \end{vmatrix}}{-42} \qquad y = \frac{\begin{vmatrix} 8 & 2 \\ 2 & -10 \end{vmatrix}}{-42}$$

$$x = \frac{42}{-42} = (-1) \qquad y = \frac{-84}{-42} = (2)$$

$$(-1, 2)$$

(P2) 3x3 with Cramer's Rule

$$ax + by + cz = j$$
$$dx + ey + fz = k$$
$$g(x) + h(y) + i(z) = l$$

$$x = \frac{\begin{vmatrix} j & b & c \\ k & e & f \\ l & h & i \end{vmatrix}}{\det A}$$

$$y = \frac{\begin{vmatrix} a & j & c \\ d & k & f \\ g & l & i \end{vmatrix}}{\det A}$$

$$z = \frac{\begin{vmatrix} a & b & j \\ d & e & k \\ g & h & l \end{vmatrix}}{\det A}$$

ic1

$$\begin{cases} x + 3y - z = 1 \quad (j) \\ -2x - 6y + z = -3 \quad (k) \\ 3x + 5y - 2z = 4 \quad (l) \end{cases}$$

Step1: determinant $3 \times 3 = -4$

Step2 Find x, y, z

$$X = \frac{\begin{vmatrix} 1 & 3 & -1 \\ -3 & -6 & 1 \\ 4 & 5 & -2 \end{vmatrix}}{-4} \qquad y = \frac{\begin{vmatrix} 1 & 1 & -1 \\ -2 & -3 & 1 \\ 3 & 4 & -2 \end{vmatrix}}{-4}$$

$$Z = \frac{\begin{vmatrix} 1 & 3 & 1 \\ -2 & -6 & -3 \\ 3 & 5 & 4 \end{vmatrix}}{-4}$$

$\left(\frac{-8}{-4}, \frac{0}{4}, \frac{-4}{-4}\right)$

$\left(\frac{+2}{x}, \frac{0}{y}, \frac{1}{z}\right)$

11/20/19

4.3 Determinant: — Cramer's Rule —

ie 1

$$\begin{vmatrix} 8 & 5 \\ 2 & -4 \end{vmatrix}$$

← solution determinant

Calc.

* No letters use det:

Step 1:

2ND matrix

edit 2X2

enter in numbers

Step 2:

2ND quit

Step 3:

2ND

matrix

math

1:det

Step 4

2ND matrix

A:

enter

-42

Cramer's Rule: letters in equations

ie1

	C_1	C_2	C_3	C_4
R_1	$1x$	$+3y$	$-1z$	$=1$
R_2	$-2x$	$-6y$	$+1z$	$=-3$
R_3	$3x$	$+5y$	$-2z$	$=4$

R x C
3 x 4

(2,0,1)

Step1: 3x4 add all #'s in

Step2:

2ND | Quit

Step3:

2ND | matrix | Math

B: rref | enter

Step4:

2ND | matrix | A | enter

Assign:

pgs. 218-219

#37-53 odds