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+
10.1 W.S.

10.1 Operations with Matrices

Dimension of a matrix = row x column

$A = \begin{bmatrix} 1 & 7 \\ 4 & 2 \\ 8 & 3 \end{bmatrix}$ 3 rows, 2 columns dimension = 3x2

$B = \begin{bmatrix} 1 & 4 & 8 & -7 \end{bmatrix}$ 1 row, 4 columns dimension = 1x4

ex] Identify the element of each matrix

$A = \begin{bmatrix} 4 & -2 \\ -3 & 7 \end{bmatrix}$ Find $a_{11} = 4$

first row
first column

b) $a_{12} = -2$

first row
second column

ex] $A = \begin{bmatrix} -7 & 3 \\ 1 & 8 \end{bmatrix}$ $B = \begin{bmatrix} 0 & -2 \\ 4 & 7 \end{bmatrix}$

a) $A + B = \begin{bmatrix} -7+0 & 3+-2 \\ 1+4 & 8+7 \end{bmatrix} = \begin{bmatrix} -7 & 1 \\ 5 & 15 \end{bmatrix}$

b) $B - A = \begin{bmatrix} 0-(-7) & -2-3 \\ 4-1 & 7-8 \end{bmatrix} = \begin{bmatrix} 7 & -5 \\ 3 & -1 \end{bmatrix}$

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

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10.2 Matrix Multiplication

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}\begin{bmatrix} w & x \\ y & z \end{bmatrix} = \begin{bmatrix} aw+by & ax+bz \\ cw+dy & cx+dz \end{bmatrix}$$

ex $\begin{bmatrix} -2 & 1 \\ -1 & 0 \end{bmatrix} \cdot \begin{bmatrix} -1 & -5 \\ 0 & 4 \end{bmatrix}$

$$\begin{bmatrix} -2(-1)+1(0) & -2(-5)+1(4) \\ -1(-1)+0(0) & -1(-5)+0(4) \end{bmatrix} = \begin{bmatrix} 2 & 14 \\ 1 & 5 \end{bmatrix}$$

b) $\begin{bmatrix} -1 & -5 \\ 0 & 4 \end{bmatrix} \cdot \begin{bmatrix} -2 & 1 \\ -1 & 0 \end{bmatrix}$

notice not the same

$$\begin{bmatrix} -1(-2)+-5(-1) & -1(1)+-5(0) \\ 0(-2)+4(-1) & 0(1)+4(0) \end{bmatrix} = \begin{bmatrix} 7 & -1 \\ -4 & 0 \end{bmatrix}$$

Different Dimensions multiplying

$(2\times\boxed{2})(\boxed{2}\times 2)$ — must be the same — 2×2

$(2\times\boxed{3})(\boxed{3}\times 1)$ — 2×1

$(3\times\boxed{2})(\boxed{3}\times 1)$ — can't do

ex $\begin{bmatrix} .5 & .3 & .2 \end{bmatrix}\begin{bmatrix} 90 & 80 \\ 95 & 70 \\ 75 & 85 \end{bmatrix}$ $(1\times 3)(3\times 2)$ 1×2

$$\begin{bmatrix} .5(90)+.3(95)+.5(75) & .5(80)+.3(70)+.2(85) \end{bmatrix}$$

$$\begin{bmatrix} 88.5 & 78 \end{bmatrix}$$

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10.4 W.S.

10.4 Inverse and Determinants

Determinant $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ $\det = ad - bc$

Inverse $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ $A^{-1} = \frac{1}{\det A} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

ex] $A = \begin{bmatrix} 2 & 1 \\ 3 & 0 \end{bmatrix}$

a) Find det
$2(0) - 1(3) = -3$

b) Find Inverse
$\frac{1}{-3} \begin{bmatrix} 0 & -1 \\ -3 & 2 \end{bmatrix}$ $A^{-1} = \begin{bmatrix} 0 & 1/3 \\ 1 & -2/3 \end{bmatrix}$

ex] Does the inverse of the matrix exist?

$B = \begin{bmatrix} 6 & 8 \\ 3 & 4 \end{bmatrix}$

Find det
$6(4) - 3(8) = 0$ since the det equals 0, then no inverse.

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(Need more)

10.5 Solve Matrix Equations

ex) $\begin{bmatrix} 2 & -1 \\ 0 & 2 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 8 \end{bmatrix}$

↑ Find inverse

$\det = 2(2) - (-1)(0) = 4$

$\begin{bmatrix} 1/2 & +1/4 \\ 0 & 1/2 \end{bmatrix}$ = Inverse

$$\begin{bmatrix} 1/2 & 1/4 \\ 0 & 1/2 \end{bmatrix} \begin{bmatrix} 2 & -1 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 8 \end{bmatrix} \begin{bmatrix} 1/2 & 1/4 \\ 0 & 1/2 \end{bmatrix}$$

I

$(1\times 2)\ (2\times 2)$

1×2

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2(\frac{1}{2}) + 8(\frac{1}{4}) \\ 2(0) + 8(\frac{1}{2}) \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$$

ex) $3x - 5y = 7$
$2x + y = 4$

write matrix equation

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