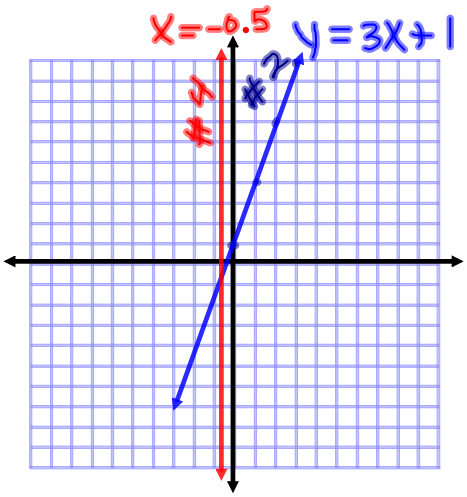
5-Minute Check

Turn to page 183 in your text and do the Prerequisite skills problems #1-8. (graph 2 & 4)

Answers
p.183
1. yes
2. yes
3. no
4. no
5. (2, 4)
6. (-1, 2)
7. (-1, 6)
8. (1,1)



4-1 An Introduction to Matrices

Objective: Be able to identify the dimension of a matrix, special types, multiply them by scalars, and use the property of matrix equality

A matrix is a rectangular array of numbers and letters.

Columns

$$A=\begin{bmatrix} g & 4 & 6 & 9 \\ 5 & 7 & M & -6 \\ 3 & 0 & -2 & t \end{bmatrix}$$ rows

$A_{3\times4}$

The dimensions of the matrix are 3x4.
(row x column)

A square matrix is a matrix having equal number of rows and columns. $\begin{bmatrix} x & 2 \\ 0 & -4 \end{bmatrix}$ (2x2)

A row matrix has only one row. $\begin{bmatrix} -\frac{1}{2} & 4 & x & -2 \end{bmatrix}$ (1x4)

A column matrix has only one column. $\begin{bmatrix} 2 \\ -3 \end{bmatrix}$ (2x1)

To multiply a matrix by a number is to multiply it by a scalar value. The rule to do this is as follows:

$$a\begin{bmatrix} b & c & d \\ e & f & g \\ h & i & j \end{bmatrix} = \begin{bmatrix} ab & ac & ad \\ ae & af & ag \\ ah & ai & aj \end{bmatrix}$$

Example 1: Use A, B, C and D to answer the following questions:

$A = \begin{bmatrix} 2 & 3 & 4 \\ -1 & 5 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 0 & 2 \\ -1 & 3 \end{bmatrix}$ $C = \begin{bmatrix} 3 & 5 & 7 \\ -9 & 4 & 2 \end{bmatrix}$ $D = \begin{bmatrix} -2 \\ 5 \\ 0 \end{bmatrix}$

a) What are the dimensions of A, B C and D? (row x column)

A_{2x3} B_{2x2} C_{2x3} D_{3x1}

b) In matrix B what element is in row 2 column 2?

3

c) Which matrix is a square matrix?

B

d) Which matrix is a column matrix?

D

e) Which two matrices have the same dimension?

A & C

Example 2: Use A, B, C and D to answer the following questions:

$A=\begin{bmatrix}2 & 3 & 4\\ -1 & 5 & 2\end{bmatrix}$ $B=\begin{bmatrix}0 & 2\\ -1 & 3\end{bmatrix}$ $C=\begin{bmatrix}3 & 5 & 7\\ -9 & 4 & 2\end{bmatrix}$ $D=\begin{bmatrix}-2\\ 5\\ 0\end{bmatrix}$

a) Find 2A $2\begin{bmatrix}2 & 3 & 4\\ -1 & 5 & 2\end{bmatrix}=\begin{bmatrix}4 & 6 & 8\\ -2 & 10 & 4\end{bmatrix}$

b) Find -3B $-3\begin{bmatrix}0 & 2\\ -1 & 3\end{bmatrix}=\begin{bmatrix}0 & -6\\ 3 & -9\end{bmatrix}$

c) Find -1C $-1\begin{bmatrix}3 & 5 & 7\\ -9 & 4 & 2\end{bmatrix}=\begin{bmatrix}-3 & -5 & -7\\ 9 & -4 & -2\end{bmatrix}$

d) Find 5D $5\begin{bmatrix}-2\\ 5\\ 0\end{bmatrix}=\begin{bmatrix}-10\\ 25\\ 0\end{bmatrix}$

Two Matrices are equal if they are of the same size and every corresponding element is equal.

For example:

If A= B and $A=\begin{bmatrix}2 & b\\ c & -1\end{bmatrix}$ $B=\begin{bmatrix}a & -5\\ 4 & d\end{bmatrix}$ then you know that a=2, b=-5, c=4 and d=-1.

Example 3:

Solve for all the variables:
if A=B and

$$A=\begin{bmatrix} 2 & x & 4y \\ -1 & 5+z & 2 \end{bmatrix}=\begin{bmatrix} 2 & -3 & 8 \\ -1 & 7 & -2m \end{bmatrix}=B$$

$2=2$ $x=-3$ $4y=8$

$-1=-1$ $5+z=7$ $y=2$

$z=2$ $2=-2m$

$-1=m$

Example 4:

Solve for x and y if $\begin{bmatrix} 2x+3y \\ x-y \end{bmatrix}=\begin{bmatrix} 7 \\ 1 \end{bmatrix}$

$\begin{cases} 2x+3y=7 \\ x-y=1 \leftarrow 3 \end{cases}$

$2x+3y=7$

$+3x-3y=3$

$5x \quad =10$

$x=2$

$4+3y=7$

$3y=3$

$y=1$

$(2,1)$

Example 5: Triangle ABC has endpoints A(-1, 2), B(-4, -2), and C(3,-1)
Enlarge this triangle so that its perimeter is doubled. Use a matrix to do this.
Draw the triangles.

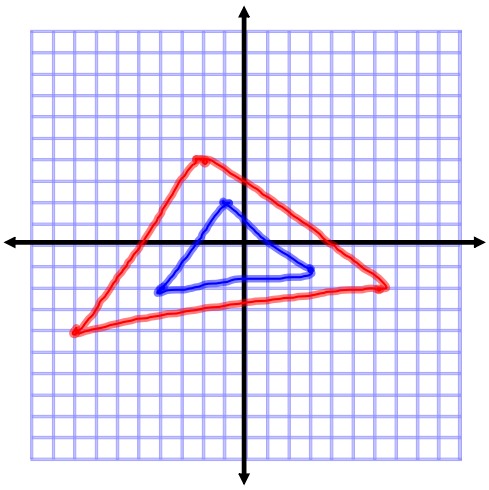
$$\Delta ABC \begin{matrix} x \\ y \end{matrix} \begin{bmatrix} -1 & -4 & 3 \\ 2 & -2 & -1 \end{bmatrix}$$

Pt 1 Pt 2 Pt 3

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

$$\begin{bmatrix} -2 & -8 & 6 \\ 4 & -4 & -2 \end{bmatrix} \bigstar$$

A' B' C'



Assignment:

p. 191 #7-22, 25