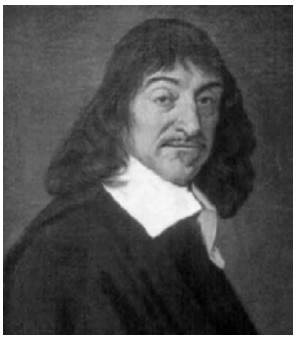
Calculus Preparation

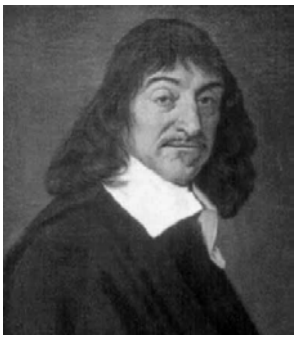
•Graphing an Equation---
Point plotting

A little history



- René Descartes
- 1596-1650
- philosopher
- mathematician
- joined algebra and geometry
- Cartesian plane

René Descartes



"Each problem that I solved became a rule which served afterwards to solve other problems."

Now look at a specific equation

$$y = -2x + 4$$

•<u>Analytically</u> or

<u>"Algebraically"</u>

Analytically

$y = -2x + 4$

$x = 3, y = -2$

We substitute **values** in the equation for **x** and **y**

Analytically

$y = -2x + 4$

$x = 3, y = -2$

$(-2) = -2(3) + 4$

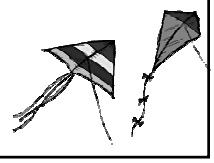
Analytically

$y = -2x + 4$

$x = 3, y = -2$

$(-2) = -2(3) + 4$

$-2 = -6 + 4$



Analytically

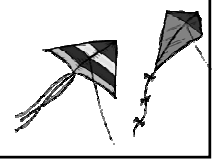
$y = -2x + 4$

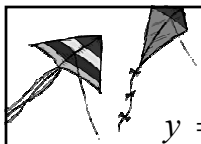
$x = 3, y = -2$

$(-2) = -2(3) + 4$

$-2 = -6 + 4$

$-2 = -2$





Analytically

$y = -2x + 4$

$x = 3, y = -2$

$(-2) = -2(3) + 4$

$-2 = -6 + 4$

$-2 = -2$

Analytically

$y = -2x + 4$

$x = 3, y = -2$

$-2 = -2$

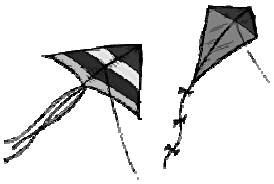
Therefore, **(3,-2)** is called a **solution** of the equation

(3,-2)

Solution: A **solution** of an equation is any value of the variable(s) for which the equation is true

Now look at the equation

$$y = -2x + 4$$



•Numerically

Numerically

$y = -2x + 4$

We will build a **table…**

x	y

Numerically

$y = -2x + 4$

The **table** is made up of **solutions** to the equation

x	y

Numerically

$y = -2x + 4$

$x = -1$

$y = -2(-1) + 4$

$y = 6$

$(-1, 6)$

Using **substitution** we find the **solutions** for the **table**

Numerically

$y = -2x + 4$

We begin the **table** with the **solution** found

x	y
-1	6

Numerically

$y = -2x + 4$

$x = 0$

$y = -2(0) + 4$

$y = 4$

$(0, 4)$

We find more **solutions**… for the **table**

Numerically

$y = -2x + 4$

The **table** values continue…

x	y
-1	6
0	4

Numerically

$y = -2x + 4$

and continue…

x	y
-1	6
0	4
1	

Numerically

$y = -2x + 4$

x	y
-1	6
0	4
1	2

Numerically

$y = -2x + 4$

x	y
-1	6
0	4
1	2
2	

Numerically

$y = -2x + 4$

x	y
-1	6
0	4
1	2
2	0

Numerically

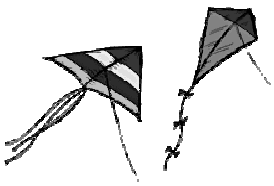
$y = -2x + 4$

A **table** is a **finite** number of **solutions,** although most equations have an **infinite** number of solutions

x	y
-1	6
0	4
1	2
2	0

Now look at the specific equation

$$y = -2x + 4$$



•Graphically

Graphically

The set of all (x,y) solution points is the called the **graph** of the equation

Graphically

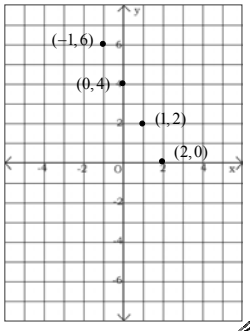
From the previous **table** we have **solutions** for:

$y = -2x + 4$

$(-1,6),(0,4),(1,2), and (2,0)$

Graphically

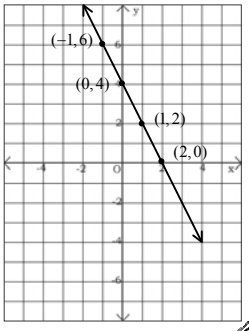
$y = -2x + 4$



We **plot** the **points** in an x-y plane

Graphically

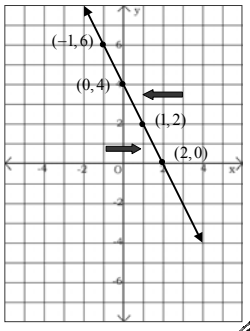
$y = -2x + 4$



Then we **connect** the points with a **smooth** line

Graphically

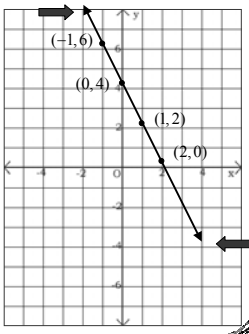
$y = -2x + 4$



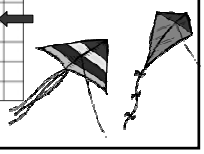
Remember the line has **infinite** solutions **between** the plotted points

Graphically

$y = -2x + 4$

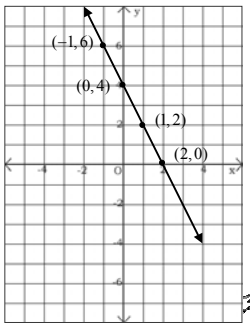


Remember the line has **infinite** solutions **between** the plotted points and **extends** in both directions



Graphically

$y = -2x + 4$



The line is called the **graph** of the equation

In Calculus we will examine problems:

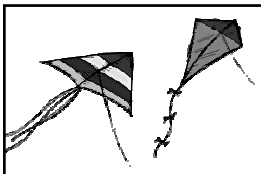
analytically--- **algebra**ically examining the equation

numerically---with a **table** or chart of the equation **and/or**

graphically---looking at the **graph** of the equation

Now a look at another equation

$$y = x^2 - 3$$



Numerically
Graphically

- construct a table of values
- plot the points
- graph

Numerically

$y = x^2 - 3$

Build a **table…**

x	y
-1	

Numerically

$y = x^2 - 3$

Build a **table…**

x	y
-1	-2

Numerically

$y = x^2 - 3$

x	y
-1	-2
0	

Numerically

$y = x^2 - 3$

x	y
-1	-2
0	-3

Numerically

$y = x^2 - 3$

x	y
-1	-2
0	-3
1	

Numerically

$y = x^2 - 3$

x	y
-1	-2
0	-3
1	-2

Numerically

$y = x^2 - 3$

x	y
-1	-2
0	-3
1	-2
2	

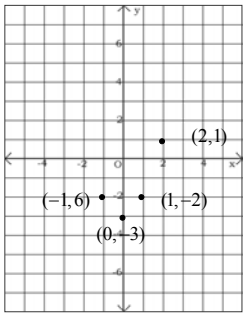
Numerically

$y = x^2 - 3$

x	y
-1	-2
0	-3
1	-2
2	1

Graphically

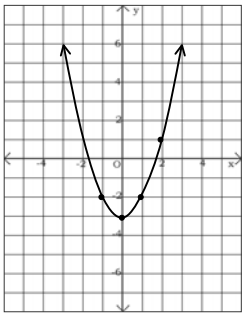
$y = x^2 - 3$



We **plot** the found **points** in an x-y plane.

Graphically

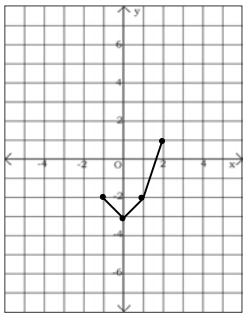
$y = x^2 - 3$



We connect the points with a smooth **curve**

Graphically

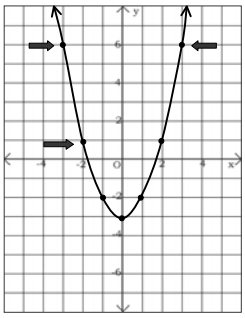
Warning: use a **smooth curve** **NOT** **straight lines**



$y = x^2 - 3$

Graphically

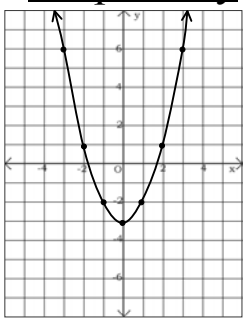
Warning: Use **more points** if the shape of the graph is not apparent



$y = x^2 - 3$

Graphically

This shape graph is called a **parabola**

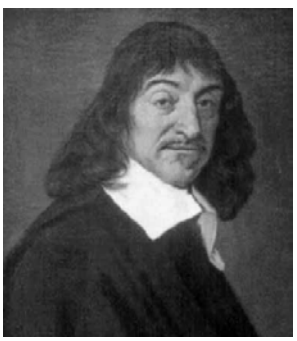


$y = x^2 - 3$

Point Plotting

- Given an **equation**
- Make a **table** or chart with ordered pairs that are **solutions** for the equation
- **Plot** the ordered pairs on an x-y plane
- Make sure there are enough points to show the actual line or curve
- **Draw the line or smooth curve** that represents the equation

René Descartes



"Each problem that I solved became a rule which served afterwards to solve other problems."

Calculus Preparation

•Graphing an Equation---
Point plotting

You can do this!