Sec 7.1 Graphing and Functions

René Descartes (1596-1650)

Cartesian coordinate system.

Allows us to draw pictures of algebra.

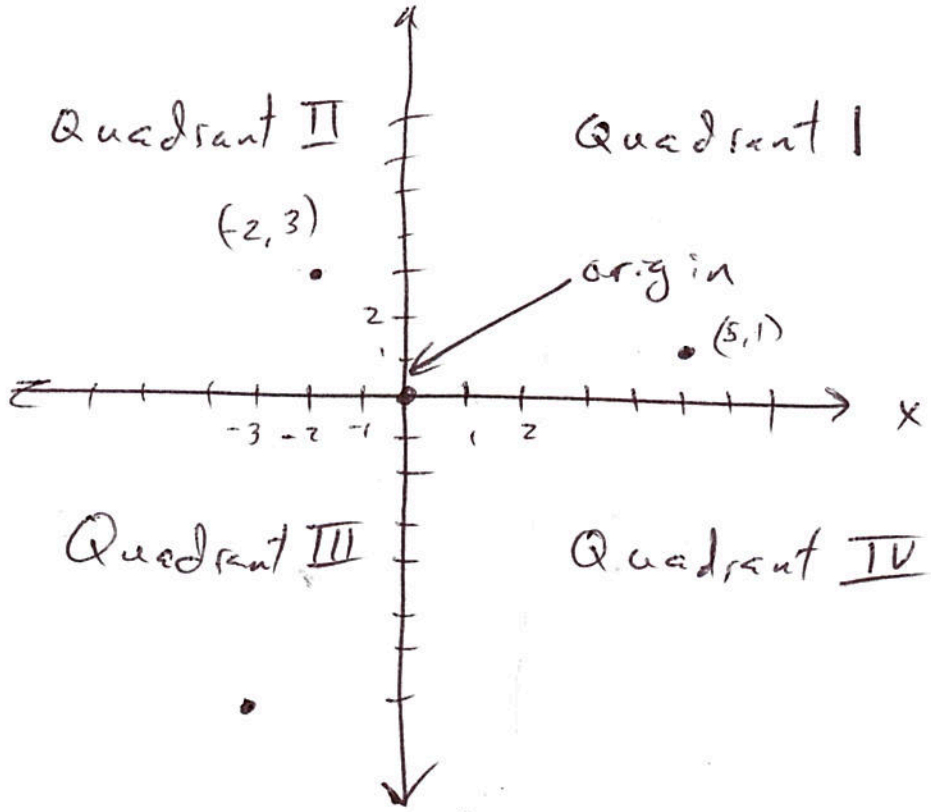
Formerly, pictures were geometry,

Algebra was often words.

Two number lines, at right angles

horizontal x-axis

vertical y-axis



plot points (5, 1)

(-2, 3)

(-3, -7)

Graphs of Equations

Relationships between quantities can be expressed as equations in two variables such as

$$y = x^2 - 3.$$

This might express fuel economy as a function of speed,

Cost of production as a function of units produced, or something else.

A solution is an ordered pair of real numbers such that when the first number is substituted for x and the second number is substituted for y, we get a true statement.

For example, $(3, 6)$ is a solution to $y = x^2 - 3$ since

$$3^2 - 3 = 9 - 3 = 6.$$

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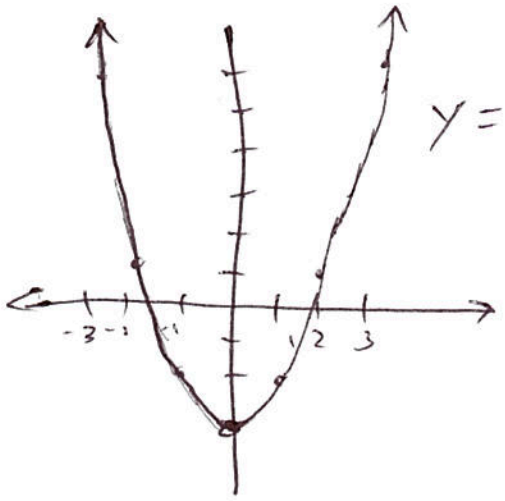
The graph of the equation is the set of all points whose coordinates are solutions of the equation.

We calculate some solutions, then connect the dots.

Start with X	Calculate y	Form ordered pair
-3	$(-3)^2 - 3 = 6$	(-3, 6)
-2	$(-2)^2 - 3 = 1$	(-2, 1)
-1	$(-1)^2 - 3 = -2$	(-1, -2)
0	$0^2 - 3 = -3$	(0, -3)
1	$1^2 - 3 = -2$	(1, -2)
2	$2^2 - 3 = 1$	(2, 1)
3	$3^2 - 3 = 6$	(3, 6)



$y = x^2 - 3$

- point plotting method

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The toll to cross a bridge costs \$3.50. A monthly pass costs \$20.00, then each crossing costs \$1.

22 28
35 30
40 40

The monthly cost y of using the bridge x times is given by

$y = 3.5x$ No pass

$y = 20 + 1x$ Pass.

A. Make a table of values

B. Graph the equations

C. Find coordinates of point of intersection and interpret.

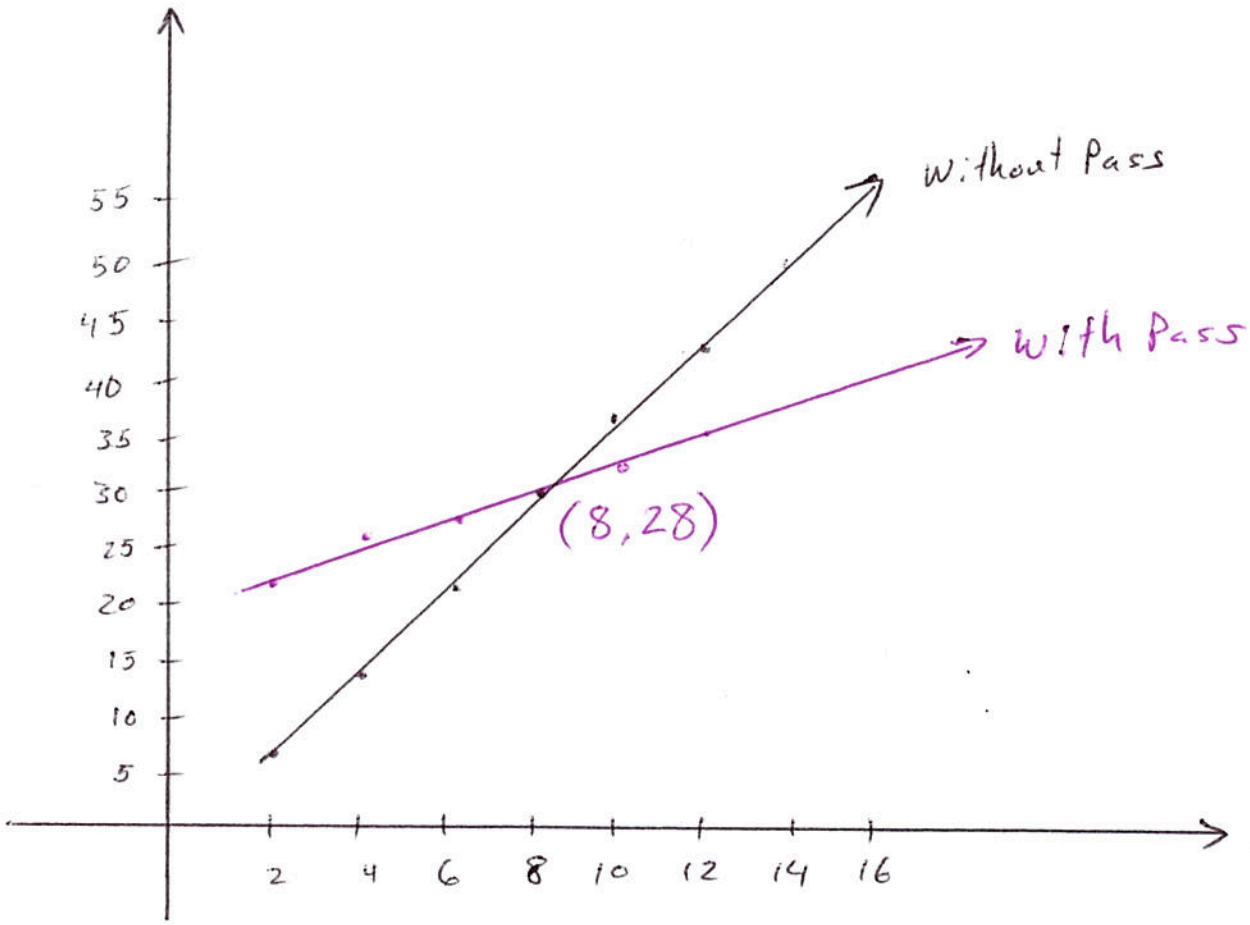
without Pass

x	y	Pair
2	7	(2, 7)
4	14	(4, 14)
6	21	(6, 21)
8	28	(8, 28)
10	35	(10, 35)
12	42	(12, 42)
14	49	(14, 49)

with Pass

x	y	Pair
2	22	(2, 22)
4	24	(4, 24)
6	26	(6, 26)
8	28	(8, 28)
10	30	(10, 30)
12	32	(12, 32)
14	34	(14, 34)

Graph of Bridge Toll problem



8 trips per month is the number at which the two plans cost the same.
For fewer trips, do not get a pass.
For more trips, get a pass.

Functions.

If an equation in two variables x and y yields precisely one value of y for each value of x, then we say that y is a <u>function</u> of x.

we write $y = f(x)$

or $y = g(x)$

or $y = h(x)$

or $y = \delta(x)$ etc.

we say "y equals f of x."

For the bridge problem, without a pass, we had $y = 3.5x$.

we could write $f(x) = 3.5x$.

Then, if $x = 10$,

$f(10) = 3.5(10) = \$35$.

The function $f(x) = 0.0875x^2 - 0.4x + 66.6$ models a car's stopping distance, in feet, on dry pavement when travelling x miles per hour.

Find the required stopping distance at 20 miles per hour.

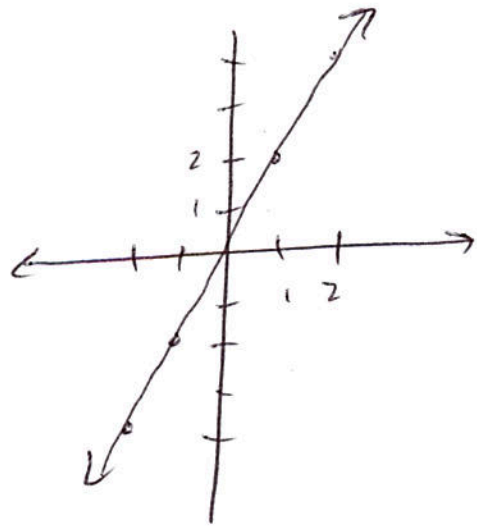
$$f(20) = 0.0875(20)^2 - 0.4(20) + 66.6$$

$$= 93.6$$

We can graph a function.

If $f(x) = 2x$, make a table of values and graph $y = f(x)$.

x	$f(x)$
-2	-4
-1	-2
0	0
1	2
2	4



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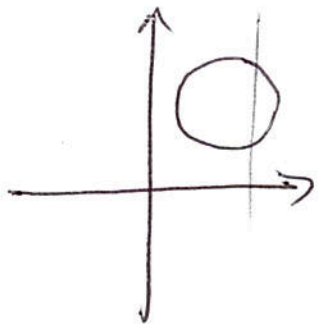
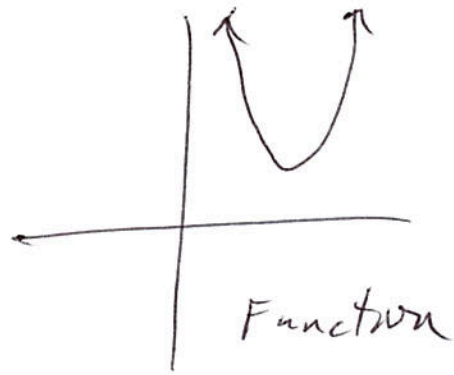
Vertical Line Test

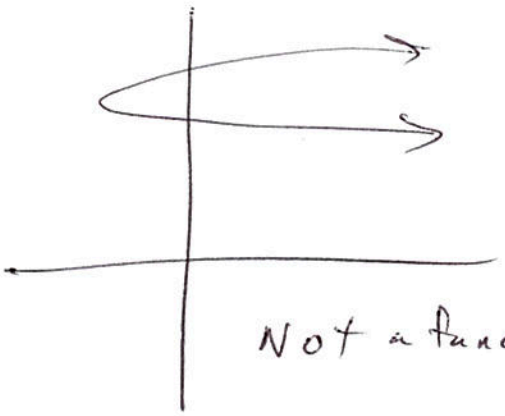
If any vertical line intersects a graph in more than one point, then the graph does not define y as a function of x.



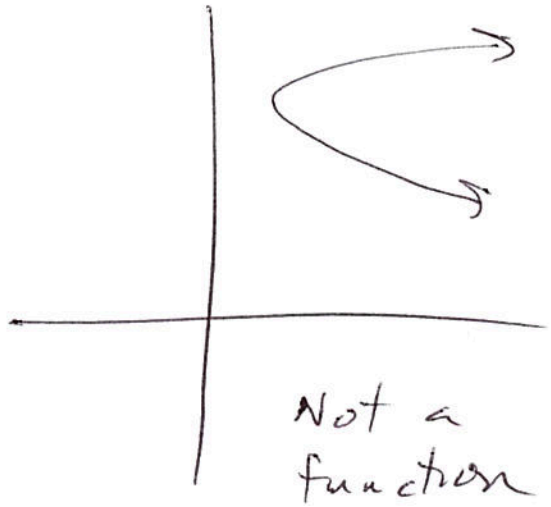
Not a function.



Function



Not a function



Not a function

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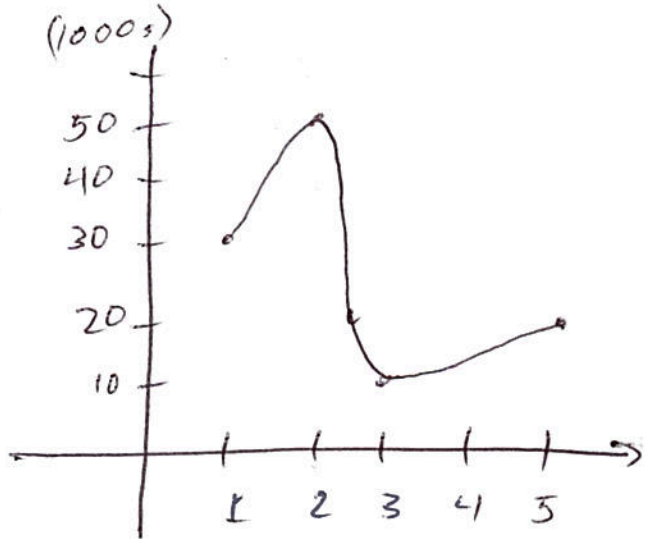

The graph approximates the approximate number of people logged on to a particular business website as a function of time of day.

How many people are logged on at 2 p.m. 50,000.

At what time(s) are there about 20000 people logged on?

2:30 pm. and at 5:00 pm