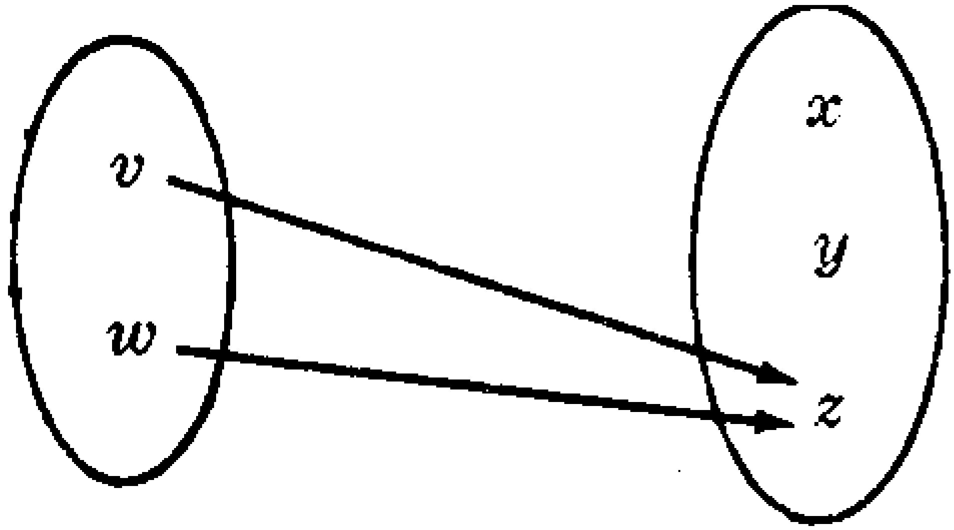


not one to one & not onto

Graph of a function:

By a *real polynomial function*, we mean a function *f*: **R** → **R** of the form

$$f(x) = a_n x^n + a_{n-1}x^{n-1} + \cdots + a_1 x + a_0$$

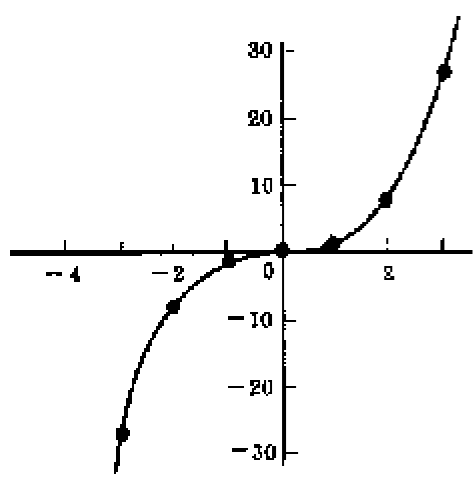
where the *ai* are real numbers. Since **R** is an infinite set, it would be impossible to plot each point of the graph. However, the graph of such a function can be approximated by first plotting some of its points and then drawing a smooth curve though these points. The table points are usually obtained from a table where various values are assigned to x and the corresponding value of f(x) computed.

Example 1 : let f:R→R and $f(x)= x^3$, find f(x)

$f(3) = 3^3 = 27$

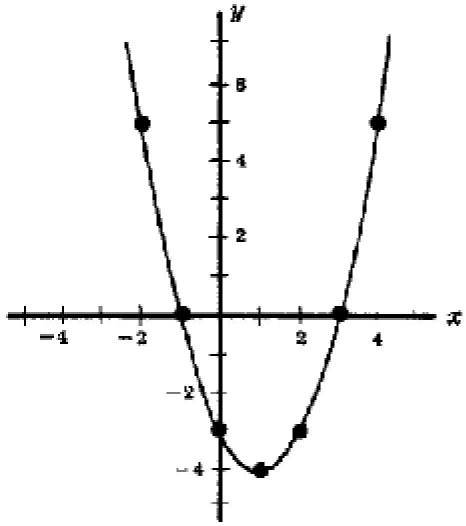
$f(-2) = (-2)^3 = -8$

x	$f(x)$
−3	−27
- 2	8
1	−1
0	0
1	1
2	8
3	27



Example 2: let f: R→R and $f(x) = x2 - 2x - 3$, , find f(x)

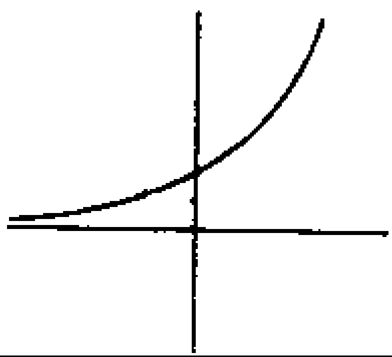
x	$f(x)$
−2	5
−1	0
0	−3
1	−4
2	−3
3	0
4	5



Geometrical Characterization of One-to-One and Onto Functions

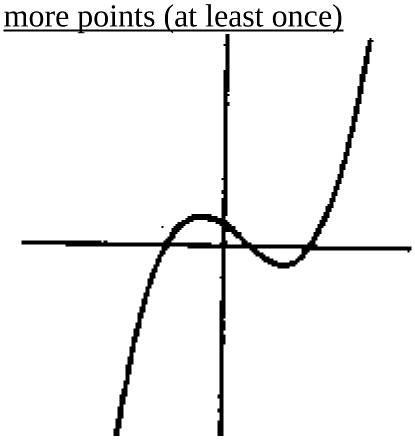
For the functions of the form f : R → R. the graphs of such functions may be plotted in the Cartesian plane and functions may be identified with their graphs, so the concepts of being one-to-one and onto have some geometrical meaning :

(1) f :R → R is said to be <u>one-to-one</u> if there are no 2 distinct pairs (a_1,b) and (a_2,b) in the graph one-to-one or if each horizontal line intersects the graph of f in <u>at most one point.</u>



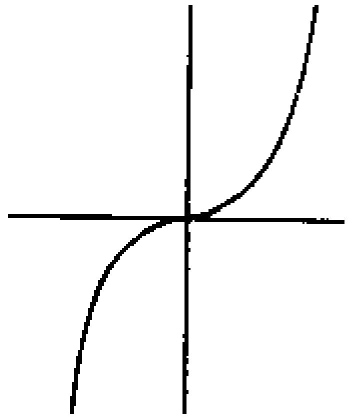
$f_2(x) = 2^x$

(2) f :R → R is an <u>onto</u> function if each horizontal line intersects the graph of f <u>at one or more points (at least once)</u>

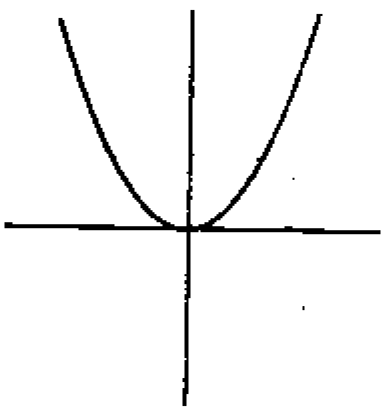


$f_3(x) = x^3 - 2x^2 - 5x + 6$

(3) if f is both one-to-one and onto, i.e. invertible, then each horizontal line will intersect the graph of f <u>at exactly one</u> point.



$f_4(x) = x^3$



$f_1(x) = x^2$

f(x) NOT (ONE-TO-ONE) & NOT (ONTO)

Composition of function:

Let f:A→B and g:B→C, to find the composition function gof:A→C

(gof)(a) = g(f(a)) = g(y) = t
(gof)(b) = g(f(b)) = g(x) = s
(gof)(c) = g(f(c)) = g(y) = t