Chapter 1 – Introduction to Functions

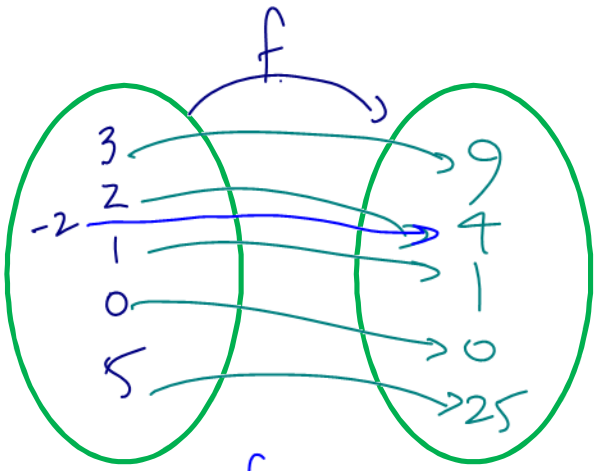
1.1 Relations and Functions (*This is a KEY lesson*!)

This course is called Functions, so it seems rather important that you know what a function actually is. Thus you need to know, very well, the following (algebraic) definition:

Definition 1.1.1

A **Function** is an algebraic rule which assigns EXACTLY ONE number (value) in a SET called the range to each number (value) in a SET called the domain

We can visualize what a function is (and **isn't**) by using so-called "arrow diagrams":



D_f

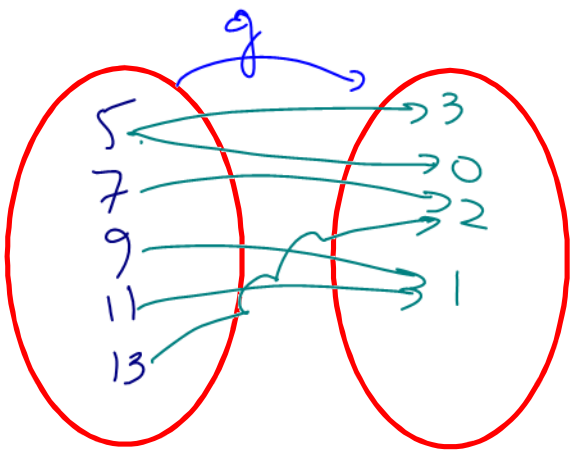
f is a fn

R_f

The domain of f

(range of f)

f "assigns" #'s together and makes points (ordered pairs) ⇒ (domain, range)



D_g

R_g

g is NOT a fn because "5" in D_g is assigned to Two range values!

We need a few more definitions before moving on, so that we can "speak the language" of functions (and that language is mathematics!)

Definition 1.1.2

A **SET** is a collection of objects. For math, sets a (usually) collections of numbers

Definition 1.1.3

A **RELATION** is a relationship between two sets of numbers: eg $y = 3x+1$ relates x values to y values

Definition 1.1.4

The **DOMAIN** of a function (or a relation) is the set of "x" values we are allowed to "plug into" the fn/relation

eg $y = \sqrt{x}$ is a relation/fn with a domain with only positive values: i.e. Domain is $x \geq 0$

Definition 1.1.5

The **RANGE** of a function (or a relation) is

the set of calculated numbers (values) from the domain through the "related rule"

Two other important terms to know are:

1) The **INDEPENDENT VARIABLE** is the domain variable

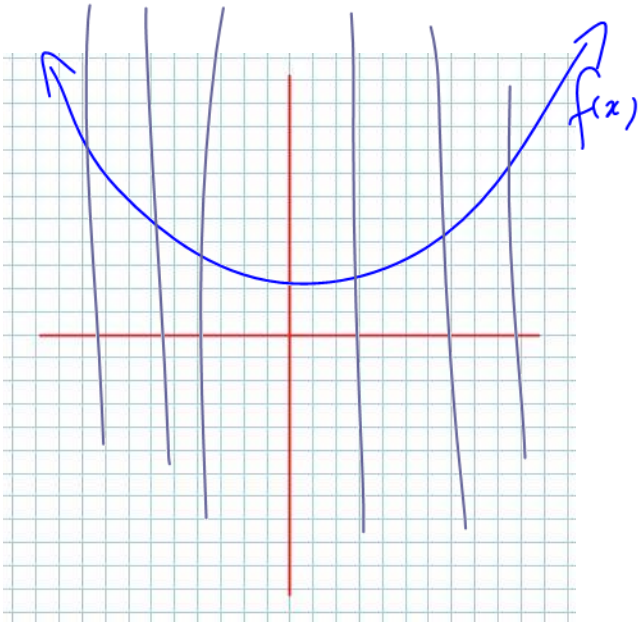
2) The **DEPENDENT VARIABLE** is the range variable

eg $f(x) = 3x + 2$

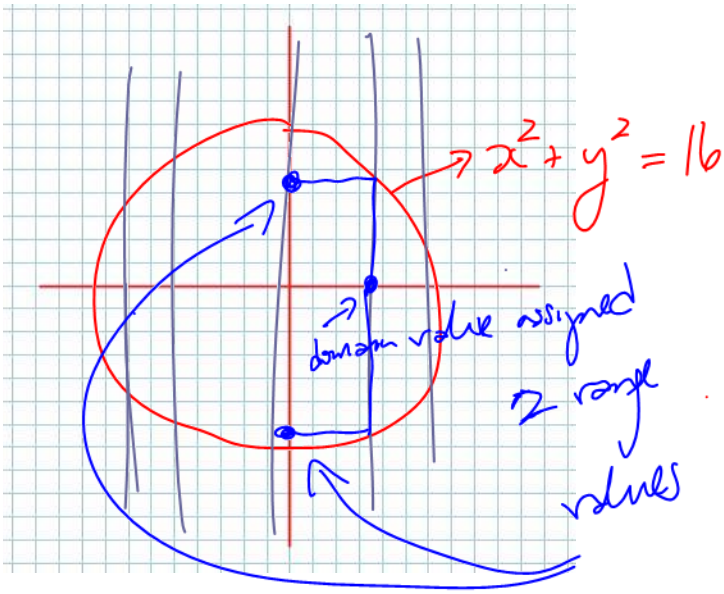
If $x = 3$ (from D_f) then $f(3) = 3(3) + 2 = 11$ giving the point $(3, 11)$

Knowing when a Relation is, and isn't, a Function

Graphically: *The Vertical Line Test* (The V.L.T.)



cuts the curve in only one place (for each domain value) ⇒ fn



NOT a fn since domain values are assigned two range values

Algebraically: (this is a "rough" way of thinking about the problem)

If the Dependent Variable is Squared, raised to the 4th, 6th, 8th, ... power ⇒ NOT a fn

e.g.

eg $y^2 = 16 - x^2$ ← not a fn

Class/Homework

Section 1.1

Pg. 10 – 12 #1, 2 (*no ruler needed…*), 6, 7, (*no need for the VLT, but do sketch graphs*!), 9, 12