Chapter 9
Graphing Functions.

Graphing Linear Functions.

A linear function will always be in the form of $f: x \longrightarrow ax + b$ and the graph will always be a straight line.

To graph a linear function we:

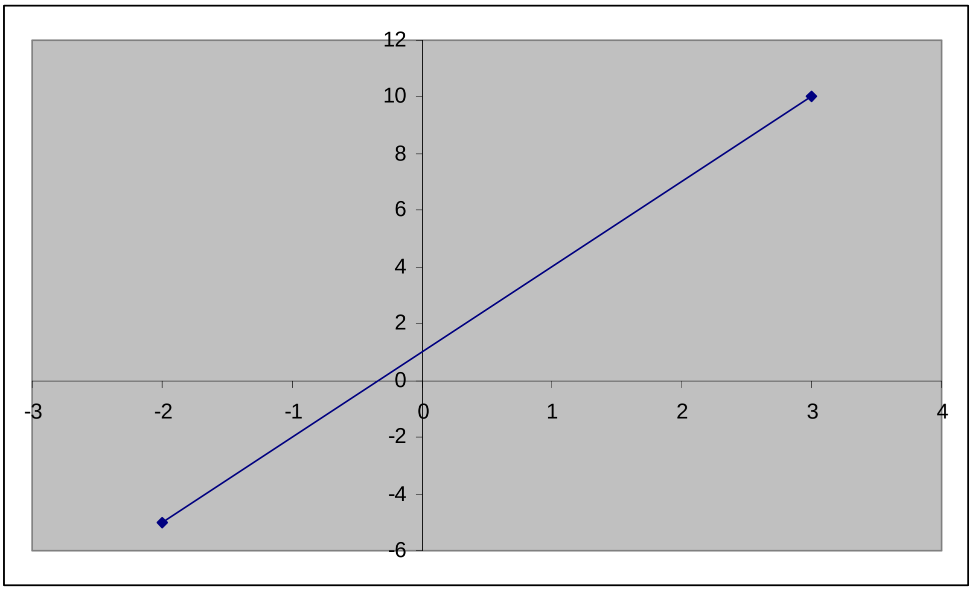
1. Choose two suitable values within the domain (2 values for x)
2. Sub these values in for x to find the values for y
3. Plot and join the points

Example:

Graph the function $f: x \longrightarrow 3x + 1$ in the domain $-2 \leq x \leq 3$

Answer.

x	3x + 1	y	
-2	3(-2) + 1	-5	(-2, -5)
3	3(3) + 1	10	(3, 10)



Graphing Quadratic Functions:

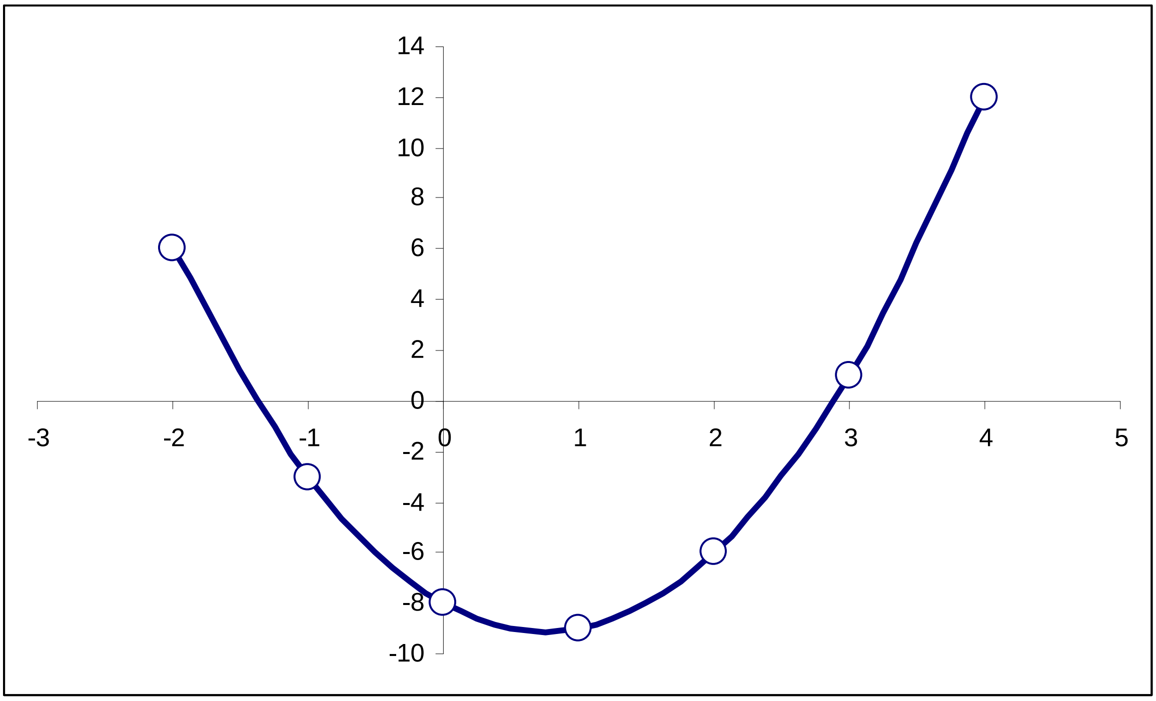
A quadratic function is usually written in the form of $f: x \longrightarrow ax^2 + bx + c$ and the graph will be U-shaped.

Example:

Graph the function $f: x \longrightarrow 2x^2 - 3x - 8$ in the domain $-2 \leq x \leq 4$

Answer:
Use each number in the domain, i.e. -2, -1, 0, 1, 2, 3, 4, as a value for x.

x	$2x^2 - 3x - 8$	y
-2	$2(-2)^2 - 3(-2) - 8$	**6**
-1	$2(-1)^2 - 3(-1) - 8$	**-3**
0	$2(0)^2 - 3(0) - 8$	**-8**
1	$2(1)^2 - 3(1) - 8$	**-9**
2	$2(2)^2 - 3(2) - 8$	**-6**
3	$2(3)^2 - 3(3) - 8$	**1**
4	$2(4)^2 - 3(4) - 8$	**12**



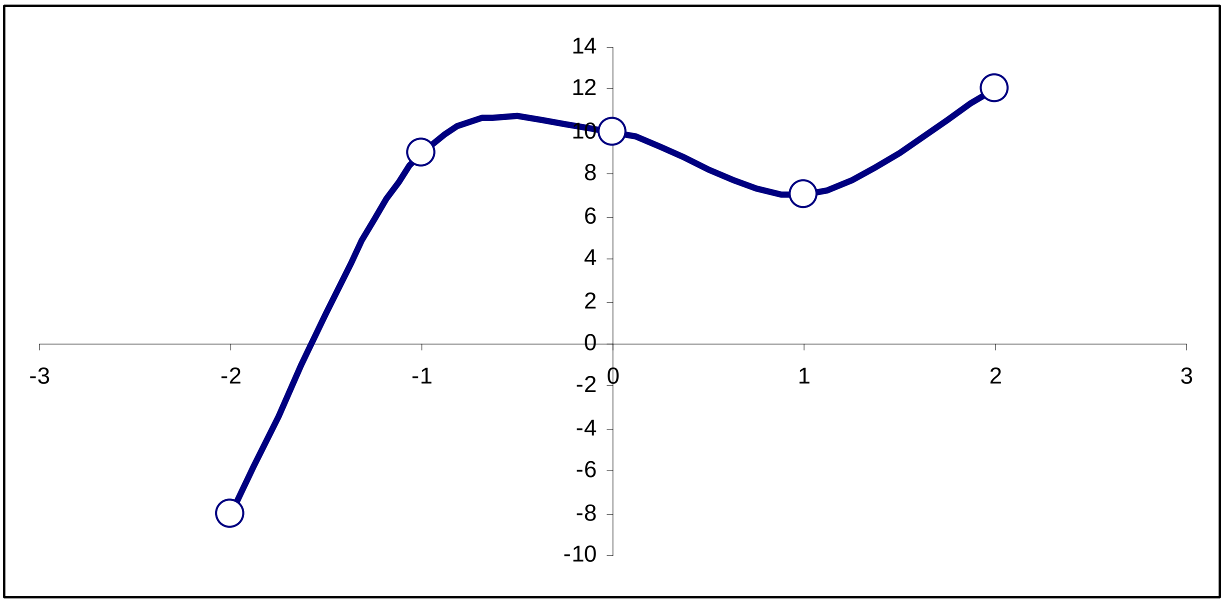
Graphing Cubic Functions:

A cubic function is usually written in the form of $f: x \longrightarrow ax^3 + bx^2 + cx + d$

Example:
Graph the function $f: x \longrightarrow 2x^3 - 2x^2 - 3x + 10$ in the domain $-2 \leq x \leq 2$

Answer:
Use each number in the domain, -2, -1, 0, 1, 2 as a value for x.

x	$2x^3 - 2x^2 - 3x + 10$	y
-2	$2(-2)^3 - 2(-2)^2 - 3(-2) + 10$	-8
-1	$2(-1)^3 - 2(-1)^2 - 3(-1) + 10$	9
0	$2(0)^3 - 2(0)^2 - 3(0) + 10$	10
1	$2(1)^3 - 2(1)^2 - 3(1) + 10$	7
2	$2(2)^3 - 2(2)^2 - 3(2) + 10$	12



Graphing Functions in the form $\frac{1}{x+a}$

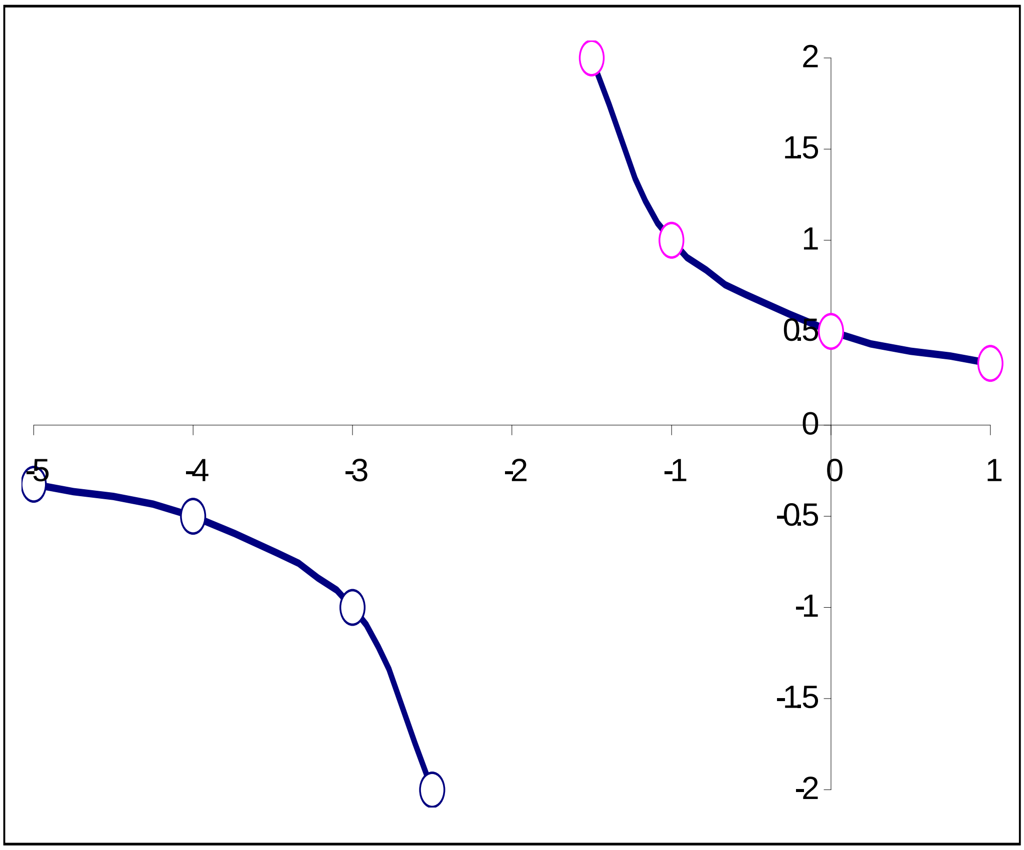
It is impossible to draw one complete curve for this type of function. The reason for this lies when the denominator of the fraction gives an answer of 0, the function becomes undefined. For this reason, we get two curves (or asymptotes)

Example:

Graph the function $f: x \rightarrow \frac{1}{x+2}$ *in the domain -5 ≤ x ≤1*

Answer:

x	$\frac{1}{x+2}$	y
-5	$\frac{1}{-5+2}$	-1/3
-4	$\frac{1}{-4+2}$	-1/2
-3	$\frac{1}{-3+2}$	-1
-2.5	$\frac{1}{-2.5+2}$	-2
-1.5	$\frac{1}{-1.5+2}$	2
-1	$\frac{1}{-1+2}$	1
0	$\frac{1}{0+2}$	1/2
1	$\frac{1}{1+2}$	1/3

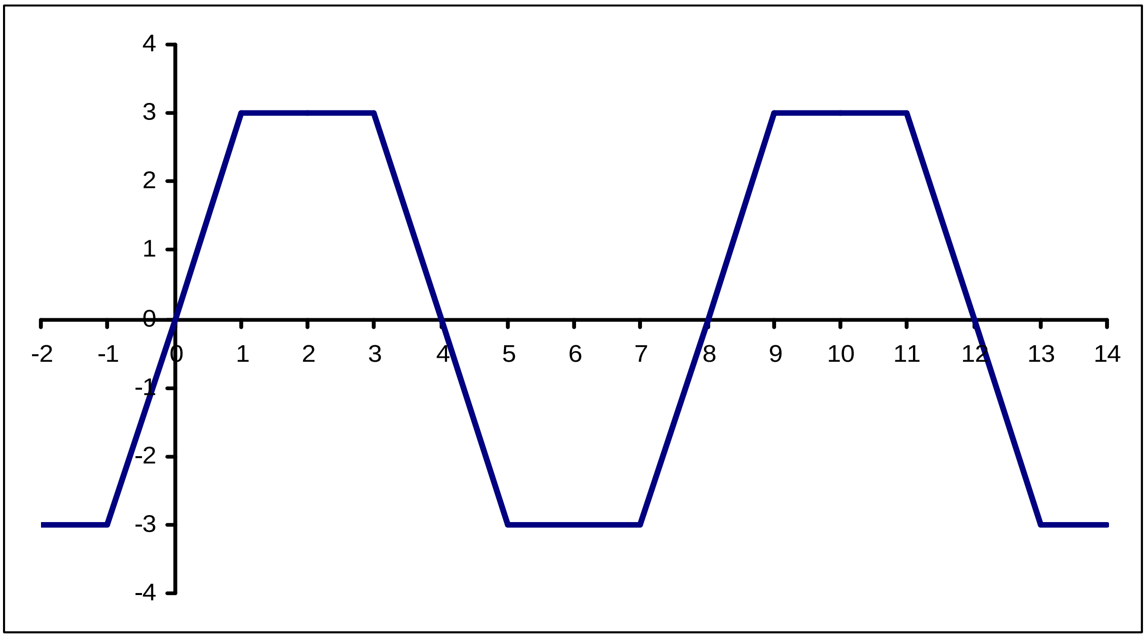


Periodic Functions:
A periodic function is a graph that repeats itself.
In these graphs we are asked for two things

1. ***Period*, which is the horizontal width it take the graph to repeat itself.**

2. ***Range*, which is the height of the graph and is read from the lowest value of y to the greatest value of y.**

Example:
Part of a graph of a periodic function y = f(x) is shown. State the period and range of the graph.



Complete the table:

x	1	4	6	8	20	54	-8	-17	2.5	-1.5
f(x)										

Answer:
Period = 8 **Range = [-3, 3]**

x	1	4	6	8	20	54	-8	-17	2.5	-1.5
f(x)	3	0	-3	0	0	-3	0	-3	3	-3

Simpson's Rule and Graphs

Simpson's rule can be used to calculate the area between the graph and the x-axis.

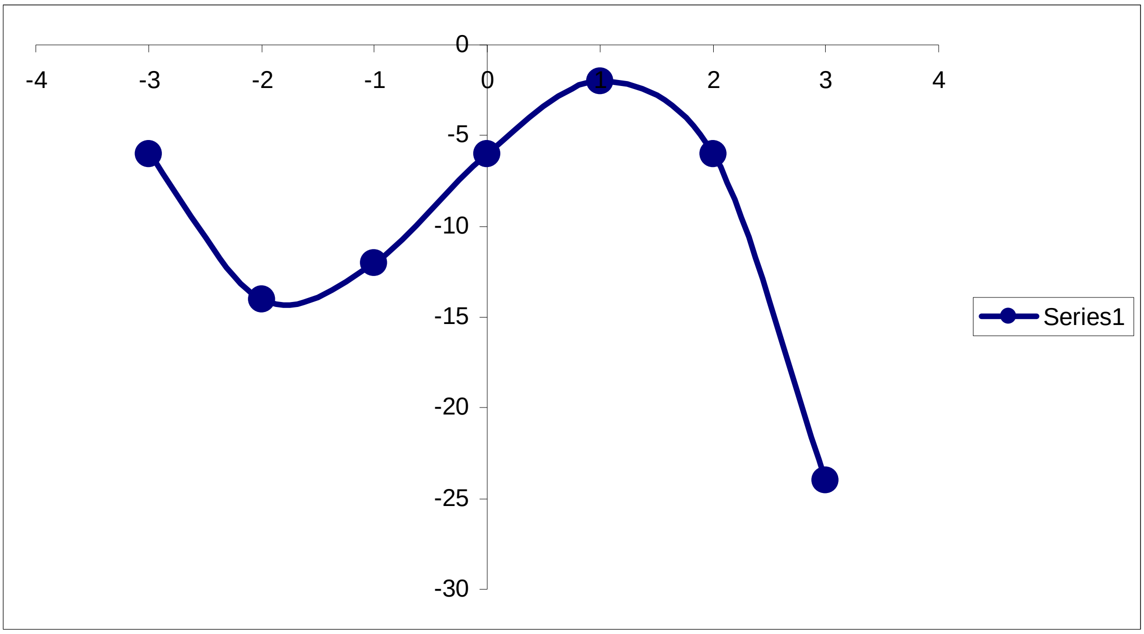
Example:

Graph the function $f: x \rightarrow -6 + 6x - x^2 - x^3$ ***in the domain*** $-3 \leq x \leq 3$

Use Simpson's rule to calculate the area between the curve and the x-axis.

Answer:

x	-3	-2	-1	0	1	2	3
f(x)	-6	-14	-12	-6	-2	-6	-24



Use Simpson's rule.

$$\text{Area} = \frac{w}{3}\left[(first + last) + 4(evens) + 2(odds)\right]$$

$$= \frac{1}{3}\left[(6+24) + 4(14+6+6) + 2(12+2)\right]$$

$$= \frac{1}{3}\left[30 + 4(26) + 2(14)\right]$$

$$= \frac{1}{3}\left[30 + 104 + 28\right] = \frac{1}{3}\left[162\right] = \underline{\underline{54}}$$