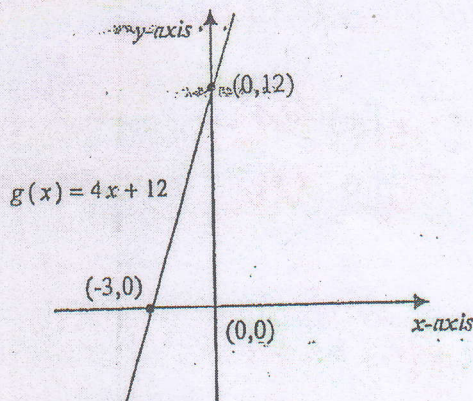Thus the graph of the function g is the straight line passing through the two points $(-3, 0)$ and $(0, 12)$.

Thus the graph of the function g is the following graph


Exercises:

1) Let $f: R \to R$ be the linear function defined by $f(x) = 3x - 10$. Find the x-intercept and the y-intercept of f.

2) Let $g: R \to R$ be the linear function defined by $g(x) = 0.3x + 0.7$. Find the x-intercept and the y-intercept of g.

3) Let $f: R \to R$ be the linear function defined by $f(x) = -4x + 8$. Find the x-intercept and the y-intercept of f, then graph the function f.

4) Let $g: R \to R$ be the linear function defined by $g(x) = 5x + 15$. Find the x-intercept and the y-intercept of g, then graph the function g.

S2.3 : Some well-known Functions and their Graphs

1) A function $f(x) = c$ where c is a fixed number is called a constant function.
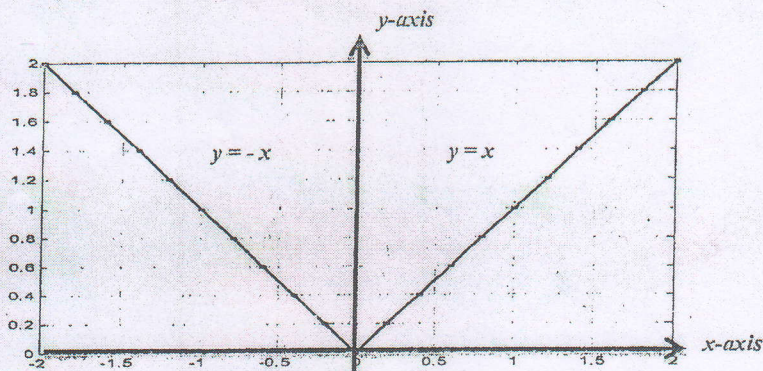
Example 2.3.1 : The function $y = f(x) = 1$ is a constant function and its graph is
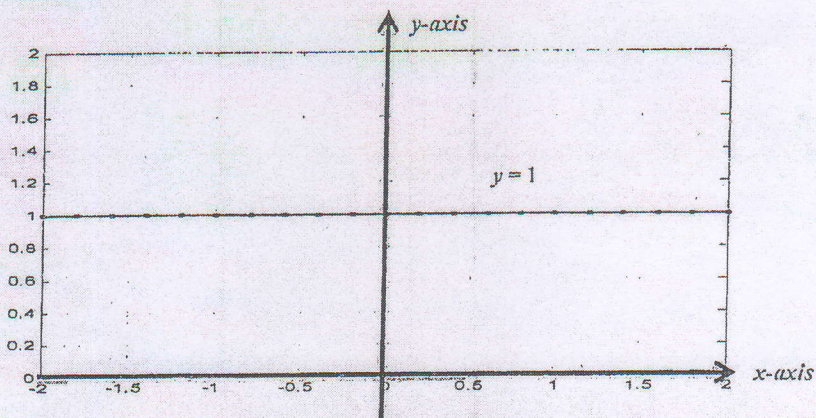
2) The absolute value function $y = f(x) = |x|$ is defined by the formula

$$y = f(x) = |x| = \begin{cases} x & if \quad x \geq 0 \\ -x & if \quad x < 0 \end{cases}$$
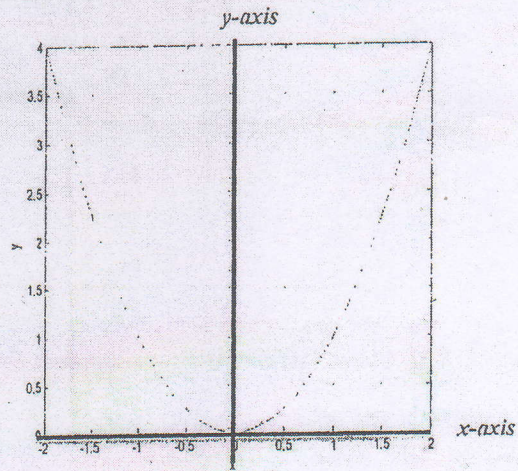
and its graph is

Remember that $|x| = \sqrt{x^2}$.

3) A function $y = f(x) = x^r$ where r is a real number is called a power function .
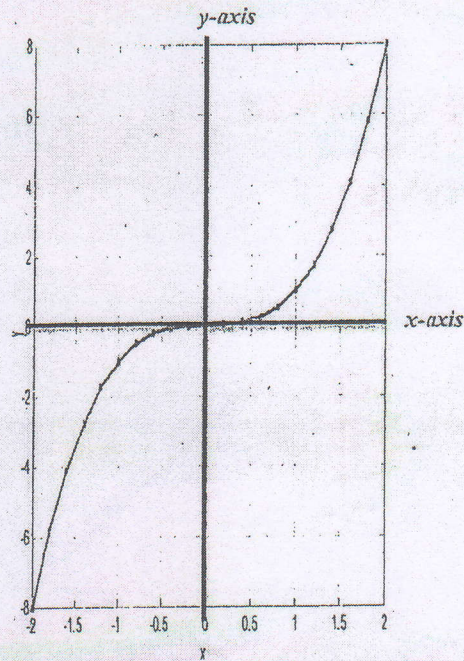
Example 2.3.2 :

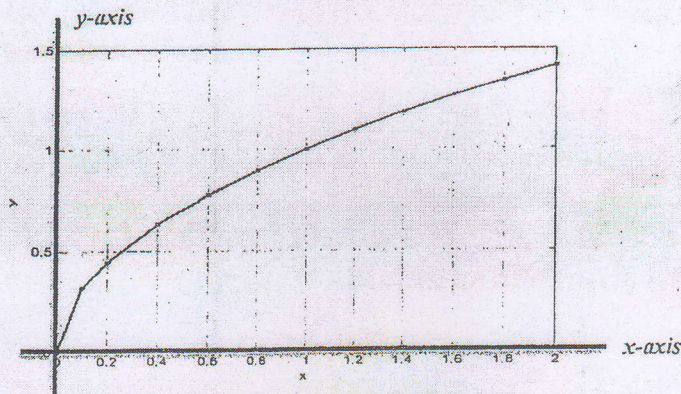The function $y = f(x) = x^2$ is a power function (which is also a quadratic function) and its graph is
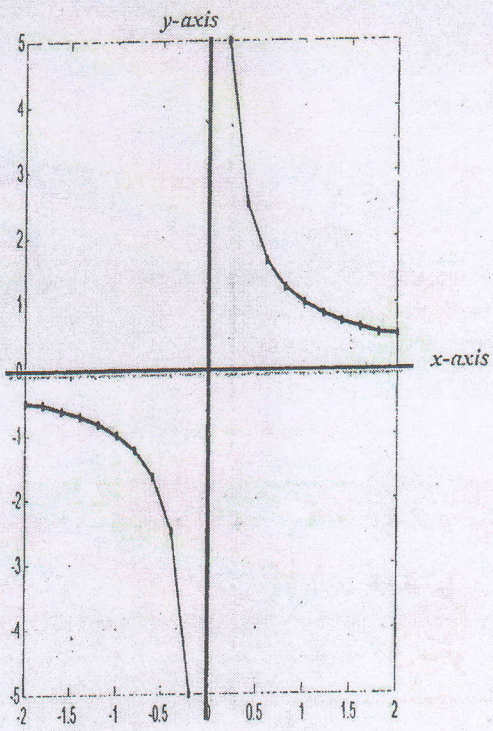
Example 2.3.3 : The function $y = f(x) = x^3$ is a power function and its graph is

Example 2.3.4 : The function $y = f(x) = \sqrt{x}$ is a power function and its graph is

Example 2.3.5 : The function $y = f(x) = \frac{1}{x}$ is a power function and its graph is

4) Let a be a positive real number other than 1. The function $y = f(x) = \underline{a}^x$ is called the exponential function with base a.

Example 2.3.6 : Graph the exponential function $y = 2^x$

Answer : To draw the graph of $y = 2^x$, we can make use of a table give values for x and find the corresponding values for y
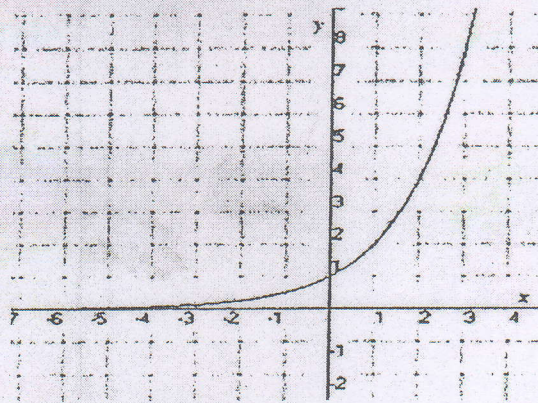
$x = 0$ gives $y = 2^0 = 1$,

$x = 1$ gives $y = 2^1 = 2$,

$x = -1$ gives $y = 2^{-1} = \frac{1}{2}$.

Following the process we make the table

x	-4	-3	-2	-1	0	1	2	3	4
2^x	0.0625	0.125	0.25	0.5	1	2	4	8	16

Example 2.3.7 : The function $y = 5^x$ is an exponential function and its graph is

Answer :

$x = 0$ gives $y = 5^0 = 1$,

$x = 1$ gives $y = 5^1 = 5$,

$x = -1$ gives $y = 5^{-1} = 0.2$

x	-2	-1	0	1	2
5^x	0.04	0.2	1	5	25
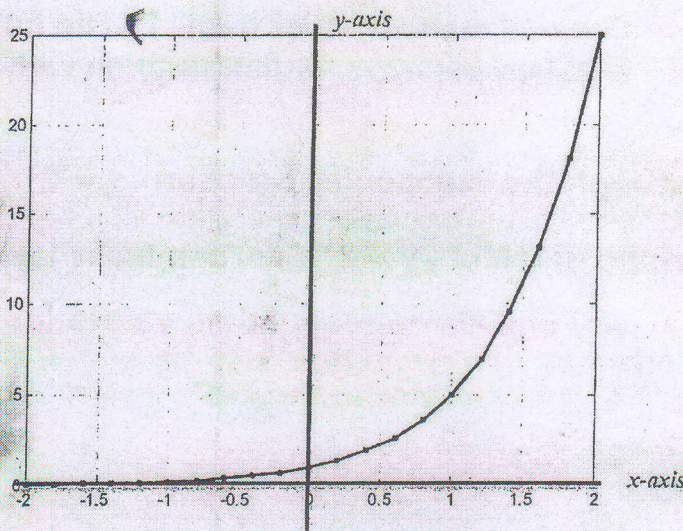
Exercise 2.3.8 : Graph the exponential function $y = 10^x$.

The properties of exponential function and their graph

- The domain is R (set of real numbers).
- The range is R^+ (set of positive real numbers).
- The graph is always continuous (no break in the graph).

Rules of Exponents : If a > 0 and b > 0 , the following rules of exponent should be hold for all real numbers x and y :

1. $a^x \times a^y = a^{x+y}$

2. $\dfrac{a^x}{a^y} = a^{x-y}$

3. $a^0 = 1$

4. $\dfrac{1}{a^x} = a^{-x}$

5. $\left(a^x\right)^y = \left(a^y\right)^x = a^{xy}$

6. $(a\,b)^x = a^x\, b^x$

7. $\left(\dfrac{a}{b}\right)^x = \dfrac{a^x}{b^x}$

5) The function $y = e^x$ is called the natural exponential function whose base is $e \cong 2.718281828$, and its graph is

x	-2	-1	0	1	2
e^x	0.1353	0.3679	1	2.718	7.389
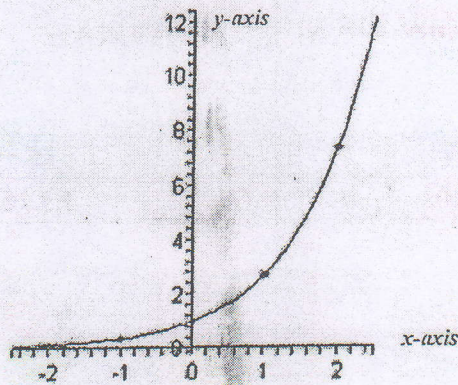
Remark : Graph of e^x and e^{-x} are reflections of each other .

6) The function $y = \log_b x$ is called the logarithm function with base b where b is a positive number $\neq 1$; and $x > 0$, and the graph of $y = \log_b x$ where b is greater than 1 is the following graph