Functions of a real variable

Let us call f a function of a real variable, which takes real values. We write $f : \mathbb{R} \to \mathbb{R} : x \to f(x)$. The graph of a function $f : \mathbb{R} \to \mathbb{R}$ is the set of points $(x, y) \in \mathbb{R}^2$ so that y is the image of x under f. We denote it by Graph(f). More concisely,

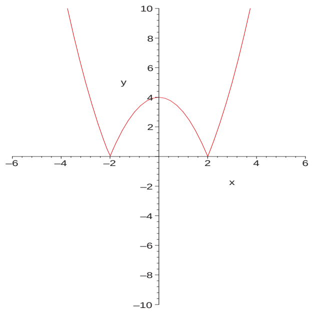
$$\text{Graph}(f) := \{(x, f(x)) : x \in \mathbb{R} \quad \text{and } f(x) \text{ exists}\}.$$

It is important to note that, for all $x \in \mathbb{R}$, there is *at most one* $y \in \mathbb{R}$ such that $(x, y) \in$ Graph(f).

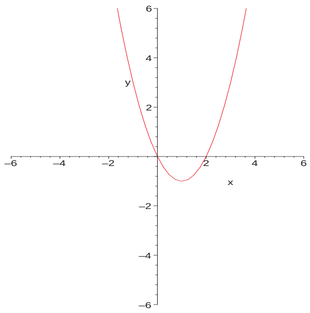
You are expected to be able to draw the graphs of elementary functions, and to perform basic manipulations of graphs (horizontal and vertical translation, symmetry w.r.t. the y-axis, the x-axis and the origin, dilatations and contractions).

Try matching the following functions to the graphs below.

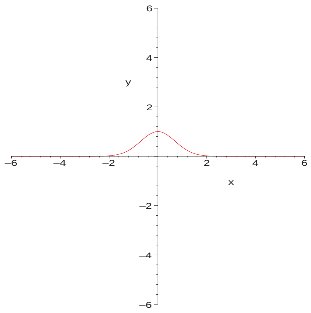
(a) $f_1(x) = \ln x$	(g) $f_7(x) = \cos 2x + 1$
(b) $f_2(x) = \arcsin x$	(h) $f_8(x) = x^2 - 2x$
(c) $f_3(x) = 1/x$	(i) $f_9(x) = x^3$
(d) $f_4(x) = \|3 - x\|$	(j) $f_{10}(x) = e^{-x^2}$
(e) $f_5(x) = x - \|x\|$	(k) $f_{11}(x) = \|4 - x^2\|$
(f) $f_6(x) = \sin(x + \pi)$	(l) $f_{12}(x) = \tan x$



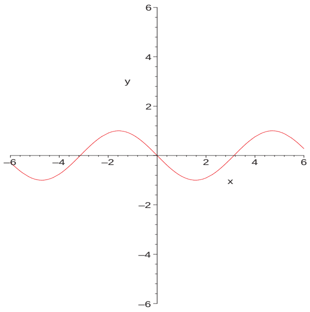
graph 1



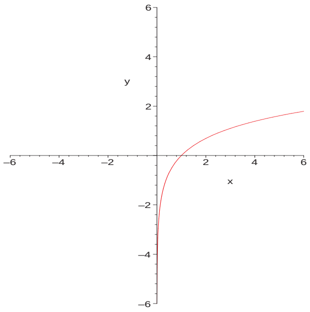
graph 2



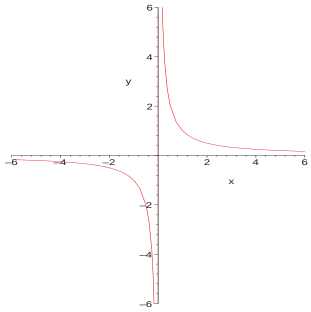
graph 3



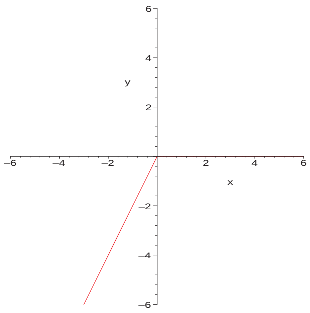
graph 4



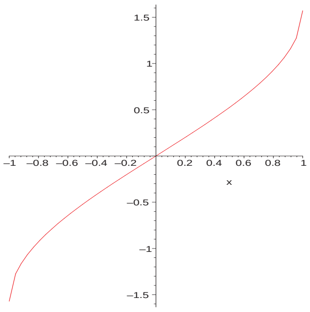
graph 5



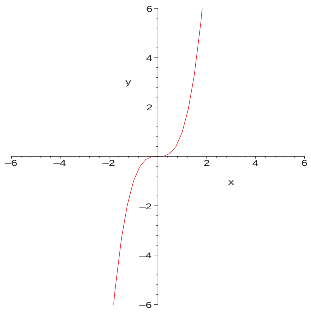
graph 6



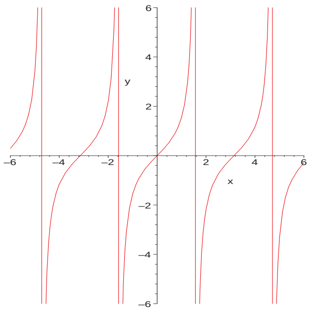
graph 7



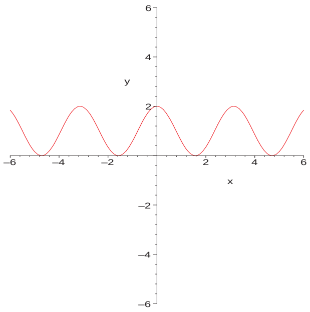
graph 8



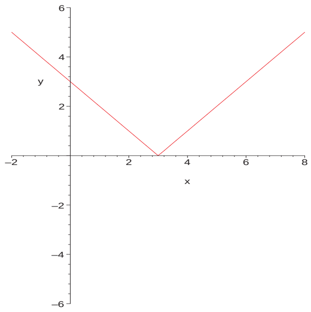
graph 9



graph 10



graph 11



graph 12

Solutions:
$f_1(x)$: graph 5; $f_2(x)$: graph 8; $f_3(x)$: graph 6; $f_4(x)$: graph 12;
$f_5(x)$: graph 7; $f_6(x)$: graph 4; $f_7(x)$: graph 11; $f_8(x)$: graph 2;
$f_9(x)$: graph 9; $f_1 0(x)$: graph 3; $f_1 1(x)$: graph 1; $f_1 2(x)$: graph 10