

1. For each of the cases below decide whether or not the variable y is a function of the variable x and discuss your answers within your group

(a) y is the outdoor temperature and x is the time of the day.

This is a function. For each time of the day there is one temperature.

(b) y is the temperature and x is a day in the year.

This is not a function. There can be many different temperatures on a particular day.

(c) y is the mother of x

This is a function in the biological sense because a child can have only one mother. If you interpret mother as a female care giver then this is not a function – a child can have more than one female care giver.

(d) y is the daughter of x

This is not a function. A person can have more than one daughter.

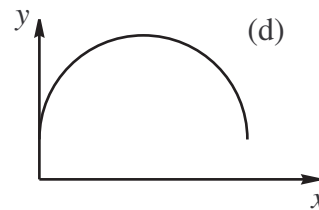
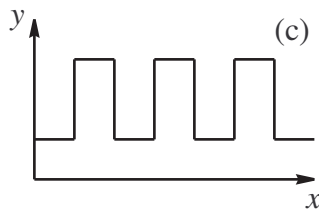
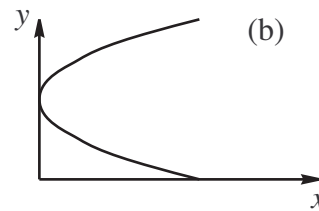
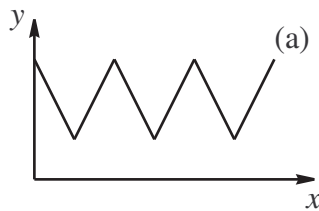
(e) $y^2 - x = 3$

This is not a function. For example for the input $x = 1$ the equation gives $y^2 - 1 = 3 \Rightarrow y^2 = 4 \Rightarrow y = \pm 2$. For one input there is two outputs.

(f) $x^2 - y = 3$

This is a function. $y = x^2 - 3$. Squaring a number gives a unique answer – as does subtracting three from a number.

2. Which of the following graphs represent functions?



If we draw a vertical line through the graph at any point and it only intersects once then it is a function. Only graphs (a) and (d) pass the vertical line test, so they are the only functions.

3. Function notation. When a variable y is a function of x it is useful to give a name to the function. Often we use the name f and express the relation as $y = f(x)$, where $f(x)$ reads as "f of x". This does not mean "f times x" but rather should be thought of as something you do to x to generate y . Usually $f(x)$ is some formula involving x . For example, if $y = x^2 + 3$ then $f(x) = x^2 + 3$ and f is the function that squares an input x and adds 3. So $f(1) = (1)^2 + 3 = 4$ and $f(-2) = (-2)^2 + 3 = 7$. For each of the following functions find $f(3)$, $f(-1)$ and $f(a + 1)$, where a is some unknown constant. Simplify your answer.

(a) $f(x) = x - 4$; $f(3) = 3 - 4 = -1$; $f(-1) = -1 - 4 = -5$; $f(a + 1) = a + 1 - 4 = a - 3$

(b) $f(x) = 2 - x^2$; $f(3) = 2 - (3)^2 = -7$; $f(-1) = 2 - (-1)^2 = 1$; $f(a + 1) = 2 - (a + 1)^2 = 2 - (a^2 + 2a + 1) = 1 - a^2 - 2a$

(c) $f(x) = x - 2^x$; $f(3) = 3 - 2^3 = 3 - 8 = -5$; $f(-1) = 2 - 2^{-1} = 2 - 0.5 = 1.5$; $f(a + 1) = a + 1 + 2^{a+1}$

(d) $f(x) = 5$; $f(3) = 5$; $f(-1) = 5$; $f(a + 1) = 5$