LO: Understand domain and range of a function; calculate composite function.

02/10/2024

1.

Sketch the graph of $y = x^2 - 5x + 4$

2.

Solve by completing the square.
Round to 2 dp.

$3x^2 - 5x - 7 = 0$

Prerequisite Retrieval

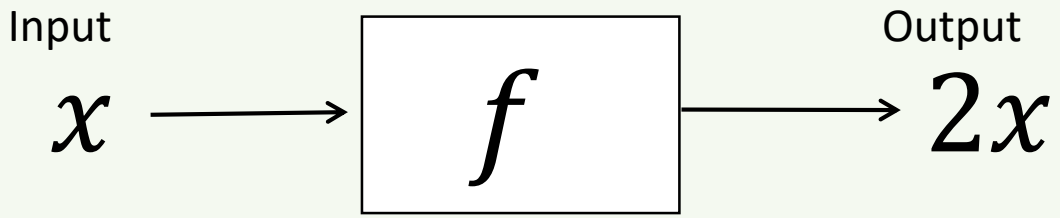
Prerequisite Problem Solving

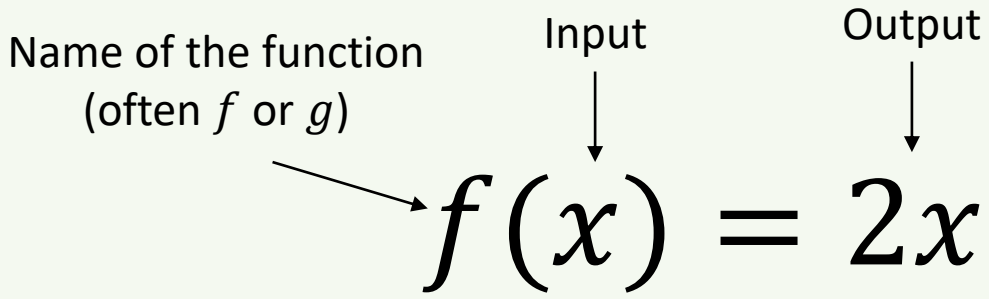
Ready to Learn

Fluency and understanding

A function is something which **provides a rule on how to map inputs to outputs**.

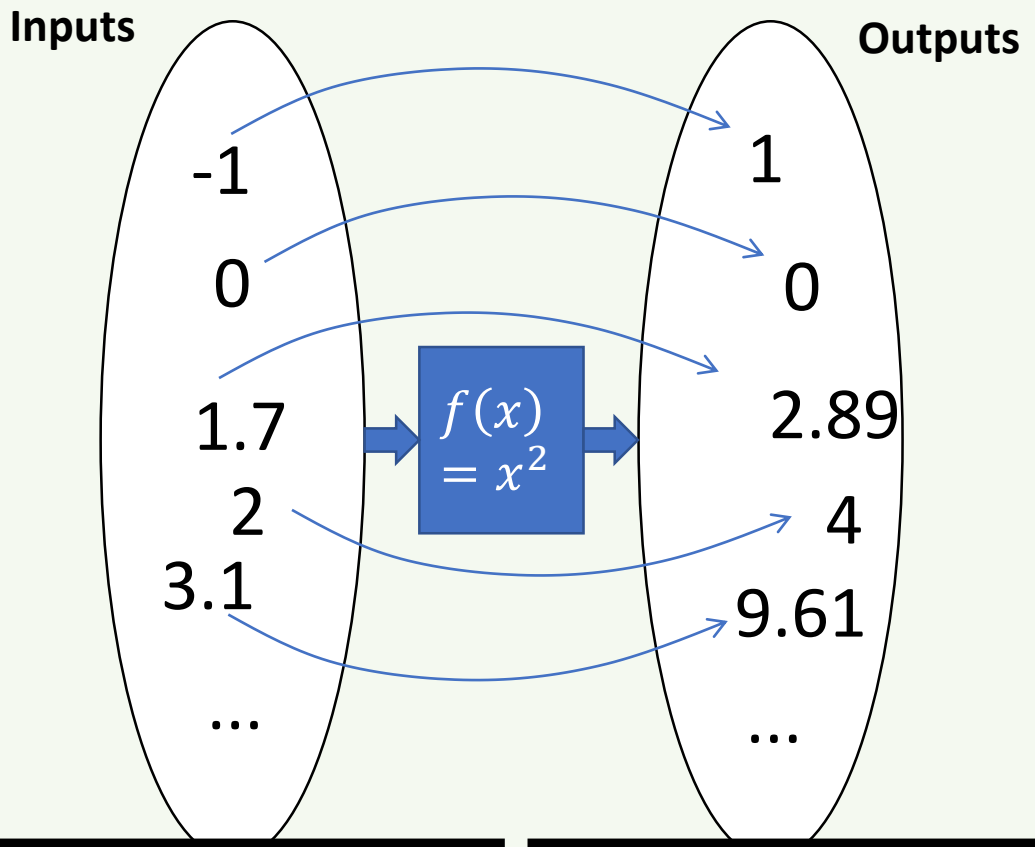
We saw at GCSE that functions were a formal way of describing a ‘number machine’:





Fluency and understanding

You'll cover functions extensively in future chapters, but for now, you need to understand the following concepts:



The **roots/zeroes** of a function are the values of x for which $f(x) = 0$.

The **domain** of a function is the set of possible inputs.

The **range** of a function is the set of possible outputs.

Worked Examples – I do

If $f(x) = x^2 - 3x$ and $g(x) = x + 5, \quad x \in \mathbb{R}$

a) Find $f(-4)$

b) Find the values of x for which $f(x) = g(x)$

Worked Examples – We do

$f(x) = 10 - 4x$ and $g(x) = x^3$

(i) Evaluate $f(-1)$ and $g\left(\frac{1}{2}\right)$.

(ii) Write down an expression for $f(3x)$.

(iii) Solve $g(x) = -64$

Independent Practice- You do

① $f(x) = 2x - 1$ and $g(x) = x^2 + 2x$

Work out the value of

(i) $f(-4)$

(iv) $g(-1)$

④ $f(x) = 8 - 3x$ and $g(x) = 4(x + 3)$. Solve

(ii) $g(x) = 20$

⑤ $h(x) = 3x - 2$

Write down expressions, giving answers in the simplest form, for

(i) $h(2x)$ (ii) $h(x + 1)$ (iii) $h(x^2)$.

Worked Examples – I do

$f(x) = x^2$ for all real values of x.

Write down the range of $f(x)$.

Worked Examples – We do

$f(x) = 6 - 4x \qquad -2 \leqslant x \leqslant 3$

Write down the range of $f(x)$.

Independent Practice- You do

① Write down the range of f(x) in each of the following.

(ii) $f(x) = x + 4 \qquad x \geqslant 1$

② Write down the range of f(x) in each of the following.

(ii) $f(x) = x - 3 \qquad 0 < x < 10$

③ Write down the range of f(x) in each of the following.

(ii) $f(x) = \dfrac{2x - 3}{4} \qquad -2 \leqslant x \leqslant 2$

Fluency and understanding

A **composite function** occurs when two or more functions act in succession.

$fg(x)$ means that the function next to x, which is g in this case, is the one that is applied first. Using $f(x) = x^2$ and $g(x) = x + 2$, it is often easier to think of this in words initially, rather than symbols.

$fg(x) = f[g(x)]$ which means that you first apply the function g to x.
$g(x) = (x + 2)$ so you now have $f(x + 2)$.

In this example the function f tells you to square what you have in the brackets, giving $(x + 2)^2$ so $fg(x) = (x + 2)^2$.

Similarly $gf(x) = x^2 + 2$

Examples – I do

Express $(5x + 6)^4$ in the form $fg(x)$, stating the expressions corresponding to $f(x)$ and $g(x)$.

Examples - I do

Given that $f(x) = 2x - 3$, $g(x) = x^2$ and $h(x) = \frac{1}{x}$, write the following as functions of x.

(i) $fg(x)$

(ii) $gf(x)$

(iii) $fgh(x)$

(iv) $f^2(x)$

Independent Practice- You do

② (i) Given that $f(x) = 2x - 1$ and $g(x) = x^3$, write

(a) $fg(x)$ and

(b) $gf(x)$.

(ii) Work out the values of

(a) $fg(2)$ (b) $gf(2)$

(c) $fg(-3)$ (d) $gf(-3)$.

Plenary

Textbook

Page 43

Exercise 3A

Q2 odd

Q3. odd

Q6

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Exercise 3B

Q4

Q6 (p.46)

Q7 (p.47)

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Exercise 3C

Q3

Q4