Your notes

Level 2 Further Maths: revision notes

Functions, domain and range

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Function notation

- $f(x) = 3x - 5$ means "the **function** f takes x, multiplies by 3 and subtracts 5". $f(4) = 3 \times 4 - 5 = 7$.
- To solve $f(x) = 11$ for $f(x) = 2x + 3$, write $2x + 3 = 11$, so $x = 4$.
- You may also meet **composite functions**, $fg(x) = f(g(x))$, and **inverse functions**, $f^{-1}(x)$, which undo f.

Domain and range

- The **domain** is the set of input values; the **range** is the set of output values.
- $f(x) = 2x + 1$ with **domain** $0 \leq x \leq 4$ has **range** $1 \leq f(x) \leq 9$.
- $f(x) = x^2$ for all real x has **range** $f(x) \geq 0$.
- Some values must be left out of the **domain**: $f(x) = 1/(x - 2)$ needs $x \neq 2$, and $f(x) = \sqrt{(x - 3)}$ needs $x \geq 3$.
- For a quadratic, complete the square to find the **range**: $x^2 - 6x + 11 = (x - 3)^2 + 2$, so the **range** is $f(x) \geq 2$.

Piecewise functions

- A **piecewise function** uses different rules on different parts of the **domain**. For example, $f(x) = x + 1$ for $x < 0$ and $f(x) = 3$ for $x \geq 0$.
- To sketch it, draw each rule only over its own part of the **domain**. Check whether the pieces join up.
- To evaluate, choose the rule for that value: here $f(5) = 3$ and $f(-2) = -1$.

Key terms

Function	A rule that gives exactly one output for each input.
Domain	The set of input values of a function.
Range	The set of output values of a function.

Piecewise function	A function with different rules on different parts of its domain.
Composite function	A function made by applying one function then another.
Inverse function	A function that undoes another function.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. $f(x) = 3x - 5$. What is $f(4)$?
2. $f(x) = x^2 + 1$. What is $f(-3)$?
3. What is the domain of a function?
4. What is the range of $f(x) = x^2$ for all real x?
5. $f(x) = 2x + 1$ with domain $0 \leq x \leq 4$. What is the range?
6. Which value must be excluded from the domain of $f(x) = 1/(x - 2)$?
7. What is the largest possible domain of $f(x) = \sqrt{(x - 3)}$?
8. What is the range of $f(x) = x^2 - 6x + 11$?

Answers

1. 7
2. 10
3. The set of input values
4. $f(x) \geq 0$
5. $1 \leq f(x) \leq 9$
6. $x = 2$
7. $x \geq 3$
8. $f(x) \geq 2$

What to do next

Practise 10 questions on this topic

Try 3 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

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