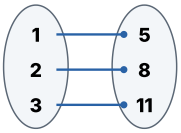
JUNIOR CYCLE MATHS · FREE REVISION SHEET

Functions & graphs

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Learning outcomes (2018 specification): AF.7a–d, AF.1c, U.4. Play the game: **leim.ie/graph-match.html**

1. What is a function?



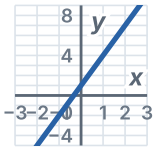
A **function** gives each input **exactly one** output. Here f(x) = 3x + 2. Two inputs may share an output; one input can't have two.

2. f(x) notation

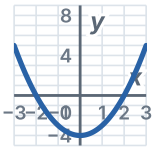
Find an output
f(x) = 3x + 2 → f(4) = 3(4) + 2 = 14
Find an input
f(x) = 11 → 3x + 2 = 11 → x = 3

f(4) = 14 means the point **(4, 14)** is on the graph. Squaring a negative: $(-3)^2 = 9$.

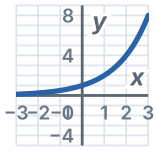
3. Linear, quadratic or exponential?



Linear 3x + 1 same jump

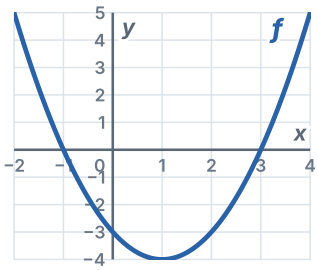


Quadratic $x^2 - 4$ jumps change evenly



Exponential 2^x × same number

4. Reading a graph



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

- **f(x) = 0**: where it crosses the x-axis: x = −1 or x = 3.
- **Minimum point**: the bottom of the ∪: (1, −4).
- **f(x) = 2**: across from 2, then down: about x = −1.4 or x = 3.4.

5. Graphs that tell a story

Straight line up: the same amount each time. Flat: no change. ∩: up then down (a maximum). Exponential: slow, then faster and faster.

6. Higher Level

f(x) = g(x): where the graphs meet.
Exponential: $f(x) = 3 \times 2^x$, $f(3) = 3 \times 8 = 24$.
Find k: $f(x) = x^2 + kx - 4$, f(2) = 6 → 4 + 2k − 4 = 6 → k = 3.

Classic mistakes: $(-3)^2 = -9$ · (y, x) instead of (x, y) · 2x and 2^x mixed up · straight lines instead of a smooth curve · one answer when there are two.

PRACTICE · 30 QUESTIONS

Have a go

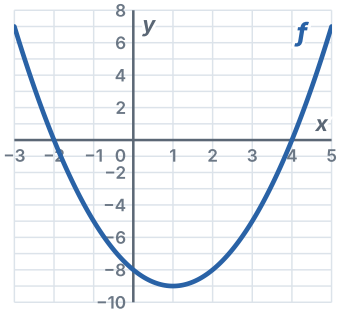
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A. Inputs and outputs

1. $f(x) = 2x + 7$. Find $f(3)$.
2. $f(x) = 2x + 7$. Find $f(-4)$.
3. $g(x) = 10 - 3x$. Find $g(5)$.
4. $h(x) = x^2 - 6$. Find $h(-3)$.
5. $f(x) = x^2 + 4x - 1$. Find $f(2)$.
6. $f(x) = 5x - 3$. Find x when $f(x) = 22$.
7. $f(x) = 4x + 9$. Find x when $f(x) = 1$.
8. Is $(3, 11)$ on the graph of $f(x) = 3x + 2$?

B. Read the graph of $f(x) = x^2 - 2x - 8$

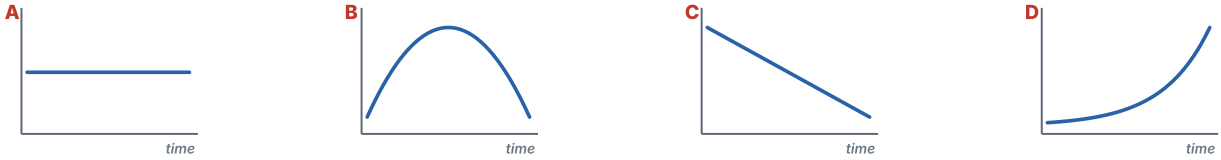
9. Use the graph to solve $f(x) = 0$. _____
10. Write down the minimum point. _____
11. Use the graph to find $f(-1)$. _____
12. Use the graph to find $f(5)$. _____
13. Use the graph to solve $f(x) = -5$. _____
14. Where does the graph cut the y-axis? _____



C. Linear, quadratic or exponential?

15. $f(x) = 4x - 1$
16. $f(x) = x^2 + 3$
17. $f(x) = 5 \times 2^x$
18. $f(x) = x(x - 6)$
19. x: 0, 1, 2, 3, 4 → $f(x)$: 2, 5, 8, 11, 14
20. x: 0, 1, 2, 3, 4 → $f(x)$: 3, 6, 12, 24, 48

D. Stories and Higher Level



21. Which graph shows: the height of a kicked ball? _____
22. Which graph shows: bacteria doubling every hour? _____
23. Which graph shows: a phone battery as you play? _____
24. Which graph shows: parking: one price all day? _____
25. Higher Level: $f(x) = 3 \times 2^x$. Find $f(4)$. _____
26. Higher Level: $f(x) = x^2 + kx - 5$ and $f(2) = 7$. Find k. _____

Questions 27–30 are on the next page.

EXAM-STYLE · THEN CHECK

Exam corner + answers

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E. Exam-style questions (show your work)

27. **A function.** f(x) = 3x − 5. (a) Find f(4) and f(−2). (b) Find x when f(x) = 10.

28. **Draw a graph.** f(x) = x^2 − 2x − 3. (a) Copy and complete the table for −2 ≤ x ≤ 4. (b) Draw the graph. (c) Use it to solve f(x) = 0 and to estimate where f(x) = 2.

29. **A ball.** Its height is h = 20t − $5t^2$ metres after t seconds. (a) Find h at t = 1, 2, 3. (b) What is the greatest height? (c) When does it land?

30. **Higher Level.** f(x) = x^2 − 2x − 3 and g(x) = x + 1. (a) Solve f(x) = g(x). (b) Is the table 2, 6, 18, 54 linear, quadratic or exponential? Write its rule (x = 0, 1, 2, 3).

Answers

A	1. 13 · 2. −1 · 3. −5 · 4. 3 · 5. 11 · 6. x = 5 · 7. x = −2 · 8. yes: f(3) = 11
B	9. x = −2 or x = 4 · 10. (1, −9) · 11. −5 · 12. 7 · 13. x = −1 or x = 3 · 14. (0, −8)
C	15. linear · 16. quadratic · 17. exponential · 18. quadratic · 19. linear · 20. exponential
D	21. B · 22. D · 23. C · 24. A · 25. 48 · 26. k = 4
E	27. (a) **7** and **−11** (b) 3x = 15, **x = 5** · 28. (a) 5, 0, −3, −4, −3, 0, 5 (c) **x = −1 or x = 3**; f(x) = 2 at about **x = −1.4 and x = 3.4** · 29. (a) 15 m, 20 m, 15 m (b) **20 m** after 2 s (c) h = 0: 5t(4 − t) = 0, **t = 4 s** · 30. (a) x^2 − 3x − 4 = 0, **x = −1 or x = 4** (b) ×3 each time: **exponential**, f(x) = 2 × 3^x

Got one wrong? Check: did you square the negative correctly? Is your point (x, y)? Did you give every answer? Then play **Graph Match** at leim.ie/graph-match.html: the "Go back over these" list at the end shows the rule for each mistake.

All questions written by Léim. Léim is independent and not connected with the State Examinations Commission or the NCCA.