Year 11 Mathematics Advanced

Topic: Working with Functions (10 of 12)
Review Questions: Piecewise-Defined Functions
Term 3, 2026

How to use this review set

These are real past-paper questions, grouped by question pattern. The grey label on each question shows where it is from and its marks.

- The questions are grouped by the pattern that keeps coming up in exams, a few of each in a row, running from the plainer patterns into the harder ones near the end. Work through them and you will meet every type an exam can throw at you.
- This set **is your diagnostic**. Working through it shows you exactly which patterns are solid and which need work. Attempt every question properly in your own book, and go back to your notes to help you work through tough questions if needed.
- Every question you get wrong, need help with or struggle with goes in your **Mistakes Log**, which you should be working on daily to get you exam-ready.

Contents

Piecewise-defined functions

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4. Analyse a piecewise function (domain, range, extrema, solve f(x)=k)
5. Find parameter(s) that make a piecewise function continuous

Piecewise-defined functions

1. Evaluate a piecewise function (numeric, algebraic, and nested)

Q1 Baulkham Hills 2020 Trial Q12(d)(i) · **1 mark**

Consider the piecewise-defined function

$$f(x) = \begin{cases} x^2 - 1 & x \leq 1 \\ 4 - x & x > 1. \end{cases}$$

Find $f(1)$.

Q2 Hurlstone 2024 Prelim Q14(a) · **1 mark**

A function is defined as follows:

$$f(x) = \begin{cases} x^2 - x + 2 & \text{when } x < 0 \\ x^3 & \text{when } x \geq 0. \end{cases}$$

Evaluate $f(-2) + f(5)$.

Q3 Cherrybrook Tech 2021 Prelim Q19(b) · **1 mark**

The function $y = f(x)$ is defined as follows:

$$f(x) = \begin{cases} -1 & x \leq -2 \\ 2x & -2 < x < 0 \\ 3 - x & x \geq 0. \end{cases}$$

Evaluate $f(-3) + f\left(\frac{1}{2}\right) + 2f(4)$.

Q4 St George Girls 2022 Prelim Q17 · **2 marks**

A function is defined by the rule

$$f(x) = \begin{cases} 1 - x & x \leq -2 \\ -1 & -1 < x < 1 \\ x + 1 & x \geq 1. \end{cases}$$

Evaluate $f(2) + f(-2)$.

Q5 Girraween 2022 Prelim Q7(d)(ii) · **2 marks**

A function $y = f(x)$ is defined as

$$f(x) = \begin{cases} x - 3 & x \leq -3 \\ 2x + 2 & -3 < x < 0 \\ x^2 & x \geq 0. \end{cases}$$

Evaluate $f(2) + f(-2) + f(-5)$.

Q6 Killara 2021 Prelim Q9(b) · **2 marks**

Given the piecewise function

$$f(x) = \begin{cases} 2x - 1 & x < -5 \\ 3 & -5 \leq x < 0 \\ (x-1)^2 + 2 & x \geq 0, \end{cases}$$

evaluate $f\left(a^2\right)$ in simplest form.

Q7 Caringbah 2023 Trial Q7 · **1 mark**

A function is given by the rule

$$f(x) = \begin{cases} (x-2)^2 & x < 2 \\ 4x - 7 & x \geq 2. \end{cases}$$

What is the value of $f(f(0))$?

(A) 5

(B) -7

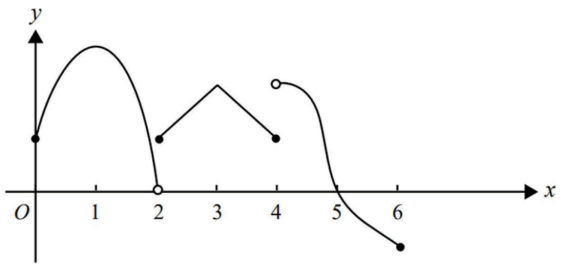
(C) 9

(D) 4

2. Continuity and discontinuity: identify, justify, and reason

Q8 North Sydney Boys 2022 Trial Q6 · **1 mark**

The graph of the function $f(x)$ with domain $x \in [0, 6]$ is shown below.



Which of the following is **not** true?

(A) The function is not continuous at $x = 2$ and $x = 4$.

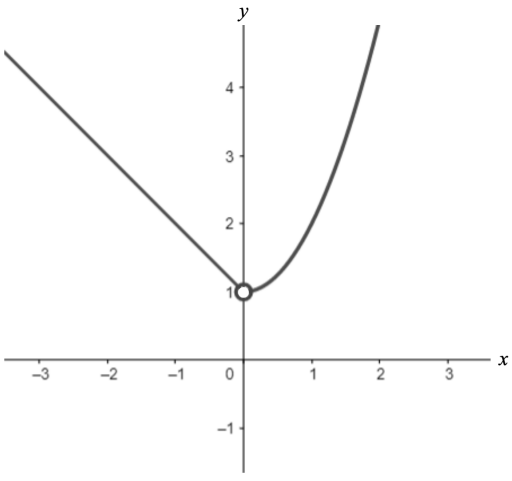
(B) The function exists for all values of x between 0 and 6.

(C) $f(x) = 0$ for $x = 2$ and $x = 5$.

(D) The function is positive for $x \in [0, 5)$.

Q9 Fort St 2021 Prelim Q6(a)(i) · **1 mark**

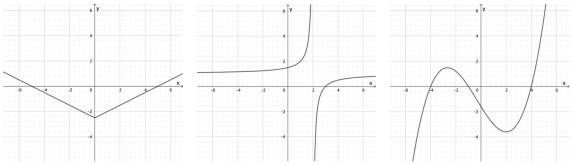
The graph of $y = f(x)$, where $x \neq 0$, is shown below.



Explain why $y = f(x)$ is continuous or discontinuous.

Q10 Hurlstone 2023 Prelim Q6 · **1 mark**

Three different functions are shown on the graphs below (Graph I, Graph II and Graph III).



Graph I Graph II Graph III

Which of the graphs is continuous for the domain $-4 \leq x \leq 4$?

(A) Graph I only

(B) Graph II only

(C) Graph III only

(D) Graphs I and III

Q11 Sydney Tech 2022 Trial Q21(a) · **1 mark**

Consider the function

$$f(x) = \begin{cases} x^2 - 2x + 2, & -3 < x < 1, \\ x + 1, & 1 \leq x < 6. \end{cases}$$

Justify why the function is **not** continuous at $x = 1$.

Q12 Presbyterian 2022 Prelim Q6 · **1 mark**

A function is defined by the rule

$$f(x) = \begin{cases} 1, & x < 1, \\ x + 2, & x \geq 1. \end{cases}$$

Which statement is **incorrect**?

(A) The value of $f(-2)$ is 1.

(B) The graph is not continuous at $x = 1$.

(C) The domain is all real values of x.

(D) The range is $y \geq 1$.

Q13 Penrith 2023 Prelim Q24 · **2 marks**

Find the values of x for which the graph of the function $f(x) = \dfrac{1}{x^2 - 9}$ is discontinuous.

Q14 North Sydney Girls 2022 Prelim Q9 · **1 mark**

Which statement is true of the function

$$f(x) = \begin{cases} x + 2, & x < 2, \\ x^2, & x \geq 2, \end{cases}$$

at the point $x = 2$?

(A) Continuous and differentiable

(B) Continuous but not differentiable

(C) Not continuous but differentiable

(D) Neither continuous nor differentiable

Q15 Killara 2022 Prelim Q8 · **1 mark**

Let f be the function defined by

$$f(x) = \begin{cases} \tan x, & x < 0, \\ -x^2, & 0 \leq x \leq 2, \\ x + 2, & 2 \leq x. \end{cases}$$

For which x value(s) is f not continuous?

(A) 0 only

(B) 2 only

(C) Both 0 and 2

(D) Neither 0 nor 2

3. Sketch the graph of a piecewise function

Q16 Sydney Grammar 2023 Prelim Q11(b)(i) · **2 marks**

Sketch the curve $y = f(x)$ where

$$f(x) = \begin{cases} -1, & \text{for } x < 0, \\ x^2, & \text{for } x \geq 0. \end{cases}$$

Q17 Baulkham Hills 2023 Prelim Q28(i) · **2 marks**

The function $y = f(x)$ is defined as follows:

$$f(x) = \begin{cases} 3x + 1, & \text{for } x < 0, \\ x^2, & \text{for } x \geq 0. \end{cases}$$

Sketch the function $y = f(x)$, showing all important features.

Q18 Roseville 2022 Trial Q22(a) · **2 marks**

Let

$$g(x) = \begin{cases} x - 1, & x < 0, \\ x^2 + 1, & 0 \leq x \leq 3. \end{cases}$$

Sketch $g(x)$, showing all essential features.

Q19 Cherrybrook Tech 2021 Prelim Q19(a) · **2 marks**

The function $y = f(x)$ is defined as follows:

$$f(x) = \begin{cases} -1, & \text{where } x \leq -2, \\ 2x, & \text{where } -2 < x < 0, \\ 3 - x, & \text{where } x \geq 0. \end{cases}$$

Draw a sketch of the graph of $y = f(x)$. Ensure your graph is large enough to clearly label the intercepts and any other relevant values.

Q20 Sydney Tech 2022 Trial Q21(c) · **3 marks**

Consider the function

$$f(x) = \begin{cases} x^2 - 2x + 2, & -3 \leq x < 1, \\ x + 1, & 1 \leq x \leq 6. \end{cases}$$

Sketch the function for the domain $-3 \leq x \leq 6$.

Q21 Abbotsleigh 2024 Prelim Q18(a) · **3 marks**

A function $f(x)$ is defined as follows:

$$f(x) = \begin{cases} 2x, & \text{for } x > 1, \\ 1 - x^2, & \text{for } -1 \leq x \leq 1, \\ -(2 + x), & \text{for } x < -1. \end{cases}$$

Draw the graph of $y = f(x)$.

Q22 Normanhurst Boys 2020 Trial Q13(a) · **4 marks**

A function is defined as

$$f(x) = \begin{cases} \log_2(x + 4), & -4 < x \leq 4, \\ 2\,|x - 5| + 1, & 4 < x < 7, \\ 5, & x \geq 7. \end{cases}$$

Sketch $f(x)$, showing all intercepts with the axes.

4. Analyse a piecewise function (domain, range, extrema, solve f(x)=k)

Q23 Knox 2022 Trial Q12 · **2 marks**

The function $y = f(x)$ is defined as

$$f(x) = \begin{cases} 1 & \text{for } -2 \leq x \leq 0, \\ -x^2 + 1 & \text{for } x \geq 0. \end{cases}$$

By sketching $y = f(x)$ or otherwise, write the domain and range of $y = f(x)$ using interval notation.

Q24 Baulkham Hills 2020 Trial Q12(d)(ii) · **2 marks**

Consider the piecewise-defined function

$$f(x) = \begin{cases} x - 1 & \text{for } x \leq 1, \\ 4 - x^2 & \text{for } x > 1. \end{cases}$$

Find x if $f(x) = 0$.

Q25 Knox 2022 Prelim Q11(d) · **2 marks**

The function $y = f(x)$ is defined as

$$f(x) = \begin{cases} x^2 + 1 & \text{for } x > 0, \\ -1 - x^2 & \text{for } x < 0. \end{cases}$$

What is the range of $f(x)$?

Q26 Abbotsleigh 2024 Prelim Q27 · **2 marks**

Consider the following function:

$$f(x) = \begin{cases} x^2 & \text{for } x < 0, \\ 2x - 3 & \text{for } x \geq 0. \end{cases}$$

Find the value(s) of x if $f(x) = 25$.

Q27 Hornsby Girls 2023 Trial Q22 · **3 marks**

Find the global maximum and minimum value of

$$y = \begin{cases} -2 & \text{for } x < -3, \\ x + 1 & \text{for } -3 \leq x < 1, \\ -x^3 - x^2 + 4 & \text{for } 1 \leq x \leq 1.5. \end{cases}$$

Show working or sketch a graph to justify your answer.

5. Find parameter(s) that make a piecewise function continuous

Q28 Gosford 2025 Trial Q5 · **1 mark**

Given that

$$f(x) = \begin{cases} 5-(x-3)^2, & x \leq 2 \\ mx+3, & x > 2 \end{cases}$$

what is the value of m for which $f(x)$ is continuous at $x = 2$?

(A) $\frac{7}{2}$

(B) $\frac{3}{2}$

(C) $\frac{1}{2}$

(D) 2

Q29 Manly 2022 Prelim Q19 · **2 marks**

Find the values of a and b for the function below, given that $g(x)$ is continuous for all x.

$$g(x) = \begin{cases} x^2-4, & x < -1 \\ ax+b, & -1 \leq x \leq 2 \\ 3x+6, & x > 2 \end{cases}$$

Q30 North Sydney Girls 2023 Prelim Q4 · **1 mark**

A function is given by

$$f(x) = \begin{cases} \dfrac{8}{\sqrt{x+1}}, & x \neq 3 \\ m, & x = 3 \end{cases}$$

For what value of m is the function continuous at $x = 3$?

(A) 4

(B) -1

(C) 1

(D) -4

Q31 Gosford 2023 Prelim Q28 · **4 marks**

Consider the function defined by

$$f(x) = \begin{cases} ax^2 + x - b, & x > 2 \\ ax + b, & 2 \leq x \leq 5 \\ 2ax - 7, & x > 5 \end{cases}$$

Given the function is continuous at $f(2)$ and $f(5)$, find the values of a and b.