Year 11 Mathematics Advanced

Topic: Working with Functions (4 of 12)
Review Questions: Quadratic and Cubic 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.

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Solving quadratics and the discriminant

1. Solving equations, and completing the square
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5. Matching a graph to its equation
6. Finding a function's equation from a graph, points or conditions

Intersections and features

7. Intersections and simultaneous equations (line-and-curve / two curves)
8. Domain, range, extreme values and polynomial language

Solving quadratics and the discriminant

1. Solving equations, and completing the square

Q1 Knox 2021 Trial Q3 · **1 mark**

The solutions to the quadratic equation $3x^2 - x - 4 = 0$ are:

(A) -1 and $-\frac{4}{3}$

(B) -1 and $\frac{4}{3}$

(C) 1 and $\frac{4}{3}$

(D) 1 and $-\frac{4}{3}$

Q2 Pymble 2022 Prelim Q22(b) · **2 marks**

Solve $x^2 + 24 = 11x$.

Q3 Sydney Grammar 2021 Prelim Q12(c)(i) · **2 marks**

Express $x^2 - 4x + 8$ in the form $(x - p)^2 + q$.

Q4 Abbotsleigh 2024 Prelim Q25 · **2 marks**

Solve $x^2 - 6x - 6 = 0$ by completing the square. Leave your answer in exact form.

Q5 Hornsby Girls 2022 Prelim Q12(a) · **2 marks**

Consider the quadratic function $f(x) = -2x^2 + 12x - 18$. Express $f(x)$ in the form $a(x - h)^2 + k$ and state the vertex of $y = f(x)$.

Q6 Girraween 2023 Prelim Q6(f) · **3 marks**

Use the quadratic formula to find the x-intercepts of the parabola $y = -7x^2 - 10x + 6$. Write your answer in the simplest surd form.

Q7 Manly 2024 Trial Q9 · **1 mark**

If $f(x) = x(x-1)$, how many different solutions are there to the equation $f(x^2) = 0$?

(A) 1

(B) 2

(C) 3

(D) 4

Q8 Kambala 2023 Prelim Q22(a) · **2 marks**

Consider the equation $x^4 - 12x^2 + 32 = 0$. Solve for x by first letting $u = x^2$.

Q9 Killara 2024 Trial Q11 · **2 marks**

Solve for x:

$$6(2x-3) = 8 - 2(3x+1).$$

Q10 Ascham 2023 Trial Q11 · **1 mark**

Solve $\dfrac{3x}{x+2} = 4$.

Q11 Sydney Grammar 2022 Prelim Q10(a) · **2 marks**

Solve $\dfrac{32}{x} - x = 4$.

Q12 Fort St 2022 Prelim Q7(b) · **2 marks**

Use the quadratic formula to solve $x^2 - 12x + 9 = 0$, giving your answer in simplest surd form.

Q13 Fort St 2023 Trial Q17 · **2 marks**

Complete the square to write the solution to $x^2 + 6x = 1$ in exact form.

Q14 Fort St 2023 Trial Q2 · **1 mark**

Solve for x: $4^{x-2} \cdot 2^{2x+3} = 8^x$.

(A) $x = 2$

(B) $x = -2$

(C) $x = -1$

(D) $x = 1$

Q15 Knox 2022 Prelim Q14(a)(i) · **2 marks**

Solve $\sqrt{x+1} = x - 2$ for x.

2. The discriminant: nature and number of roots (find the parameter)

Q16 Moriah 2021 Prelim Q2 · **1 mark**

Which statement best describes the solutions of the equation $x^2 - 4x - 3 = 0$?

(A) They are both real

(B) They are real and rational

(C) They are real and not rational

(D) They are equal

Q17 Abbotsleigh 2024 Prelim Q2 · **1 mark**

Which of the following quadratic equations has two distinct, real and rational roots?

(A) $y = -x^2 - 3x + 5$

(B) $y = 4x^2 - x - 5$

(C) $y = -x^2 - 4$

(D) $y = 2x^2$

Q18 Knox 2023 Prelim Q13(b) · **2 marks**

If $y = 3x^2 - 2x + k$ does not intersect the x-axis, find the range of possible values of k.

Q19 North Sydney Girls 2023 Trial Q13 · **2 marks**

Find the values of m if the equation $4x^2 + (m+3)x + 9 = 0$ has two equal roots.

Q20 Presbyterian 2023 Prelim Q16 · **2 marks**

Show that the line $y = 5x - 2$ is a tangent to the parabola $y = x^2 + 3x - 1$.

Q21 Sydney Grammar 2022 Prelim Q14(b) · **2 marks**

Show that $f(x) = (k+2)x^2 + 4x + k + 2$ has no x-intercepts for all $k > 0$.

Q22 Penrith 2022 Prelim Q3 · **1 mark**

What is the value of the discriminant of the quadratic equation $x^2 - 3x - 10 = 0$?

(A) -5

(B) 5

(C) 7

(D) 49

Q23 Girraween 2023 Prelim Q3 · **1 mark**

For what values of k does the equation $x^2 - 6x - 3k = 0$ have real roots?

(A) $k \geq -3$

(B) $k \leq -3$

(C) $k \leq 3$

(D) $k \geq 3$

Q24 Manly 2022 Prelim Q17 · **2 marks**

For what value of k does the equation $x^2 - 3x + k = 0$ have equal roots?

Q25 Presbyterian 2022 Prelim Q40 · **2 marks**

Use the discriminant to show that $x^2 - 2x + 4 > 0$ for all real x.

Q26 Hurlstone 2025 Trial Q15 · **4 marks**

The quadratic equation $x^2 + (m+6)x + 8m = 0$ has two distinct roots. By considering the discriminant or otherwise, determine all the possible values of m.

3. Solving quadratic and cubic inequalities

Q27 North Sydney Boys 2022 Trial Q4 · 1 mark

The solution to the inequality $6 - x - x^2 \leq 0$ is

(A) $x \leq -3$ or $x \geq 2$

(B) $x \leq -2$ or $x \geq 3$

(C) $-3 \leq x \leq 2$

(D) $-2 \leq x \leq 3$

Q28 Abbotsleigh 2020 Trial Q5 · 1 mark

Which one of the following is the set of all solutions to $2x^2 - 5x + 2 \geq 0$?

(A) $\left[\frac{1}{2}, 2\right]$

(B) $\left(\frac{1}{2}, 2\right)$

(C) $\left(-\infty, \frac{1}{2}\right) \cup (2, \infty)$

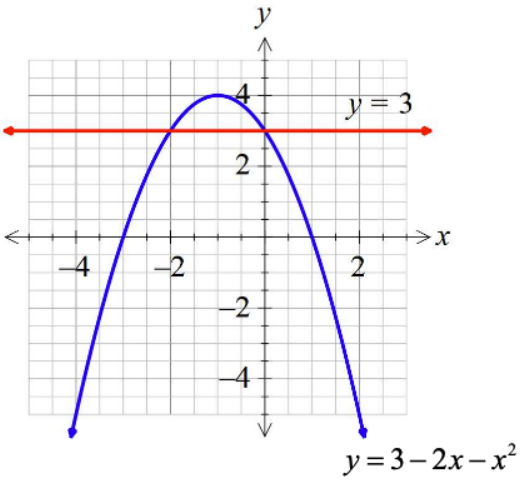
(D) $\left(-\infty, \frac{1}{2}\right] \cup [2, \infty)$

Q29 Sydney Grammar 2020 Trial Q20(c) · 2 marks

Find the values of x for which $x^2 - 6 > x$.

Q30 Ascham 2020 Trial Q7 · **1 mark**

Use the graph below to solve the inequality $3 - 2x - x^2 < 3$.



(A) $x < 0$

(B) $-2 < x < 0$

(C) $x < -2$ or $x > 0$

(D) $x < -3$ or $x > 1$

Graphs of quadratics and cubics

4. Sketching parabolas, cubics and factored polynomials from the equation

Q31 Presbyterian 2021 Trial Q20(a) · **1 mark**

The diagram shows the graph of $y = x^2 + x - 6$ for $0 \leq x \leq 4$. The point A is where the curve meets the x-axis.

Diagram to be inserted:
`adv-working-with-functions-d4-q31.png`

Find the value of A.

Q32 Gosford 2025 Trial Q11 · **2 marks**

Find the vertex of the parabola $y = x^2 - 6x + 10$.

Q33 Loreto Kirribilli 2022 Prelim Q35(a) · **2 marks**

Draw a neat sketch of $y = x^2 - 5x + 14$, labelling the vertex and any axes intercepts.

Q34 Baulkham Hills 2023 Prelim Q25 · **2 marks**

Sketch the graph of $y = (x - 1)^3 + 2$.

Q35 Hornsby Girls 2020 Trial Q18 · **5 marks**

Given that $f(x) = (x^2 - 6x)(x - 3) + 2x$.

(a) Express $f(x)$ in the form $x(ax^2 + bx + c)$, where a, b and c are constants.

(b) Hence factorise $f(x)$ completely.

(c) Sketch the graph of $y = f(x)$, showing the coordinates of each point at which the graph meets the axes.

Q36 St George Girls 2023 Prelim Q11 · 3 marks

Without using calculus, sketch the polynomial below, clearly showing the x- and y-intercepts.

$$P(x) = (x+1)(3-x)^2$$

Q37 Glenwood 2023 Trial Q27 · 3 marks

By factorising or otherwise, sketch the graph of $y = x^3 - 5x^2 - 4x + 20$, showing all intercepts with the axes. You do not need to find any stationary points.

Q38 Barker 2024 Prelim Q15(b) · 2 marks

Sketch the graph of $f(x) = -(x-1)^2(x+2)(x+5)$, showing only the x- and y-intercepts.

5. Matching a graph to its equation

Q39 Trinity Grammar 2020 Trial Q1 · 1 mark

Which equation best represents the given graph?

Diagram to be inserted:
`adv-working-with-functions-d4-q39.png`

(A) $f(x) = x^2 + 1$

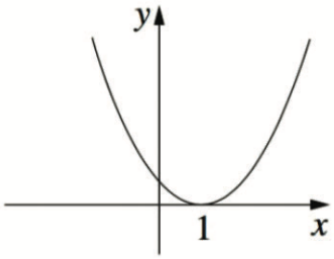
(B) $f(x) = x^2 - 1$

(C) $f(x) = (x+1)^2$

(D) $f(x) = (x-1)^2$

Q40 Girraween 2023 Prelim Q4 · **1 mark**

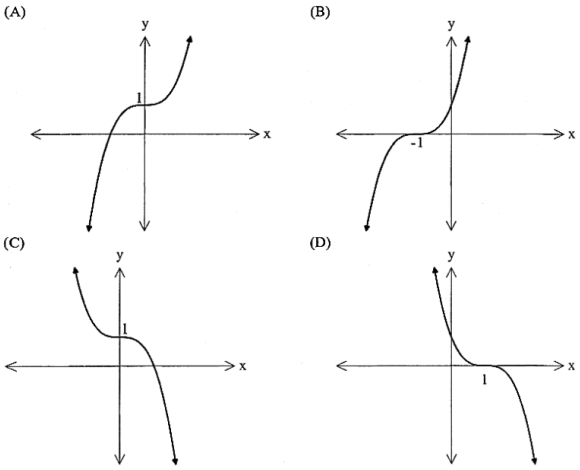
The graph of $y = 1 - x^3$ could be



NOT TO SCALE

Q41 2020 HSC Q5 · **1 mark**

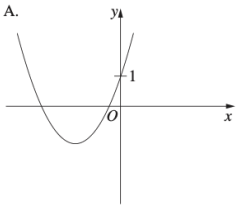
Which of the following could represent the graph of $y = -x^2 + bx + 1$, where $b > 0$?



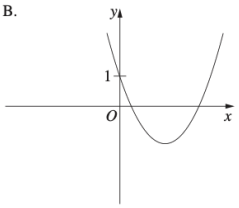
Q42 2025 HSC Q4 · **1 mark**

Which of the following best represents the graph of $y = -5x(x-2)(3-x)$?

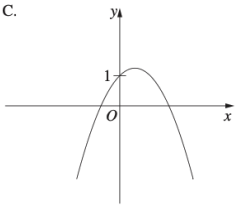
A.



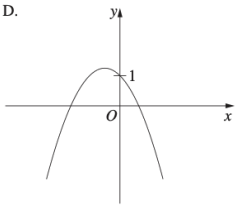
B.



C.



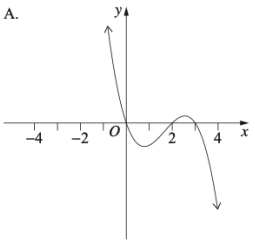
D.



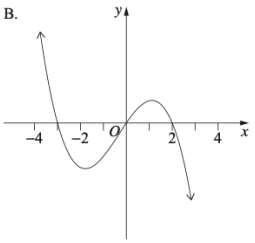
Q43 2023 HSC Q4 · **1 mark**

The graph of a polynomial is shown.

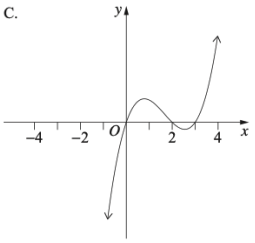
A.



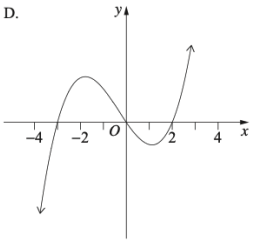
B.



C.



D.



Which row of the table is correct for this polynomial?

	Equation	Value of b	Value of c
A.	$y = -(x-b)(x-c)^2$	$b > 0$	$c < 0$
B.	$y = -(x-b)(x-c)^2$	$b < 0$	$c > 0$
C.	$y = -x(x-b)(x-c)$	$b > 0$	$c < 0$
D.	$y = -x(x-b)(x-c)$	$b < 0$	$c > 0$

6. Finding a function's equation from a graph, points or conditions

Q44 Killara 2023 Prelim Q23(a) · **1 mark**

Let $g(x) = x^2 + bx + 11$. The point $(-1, 8)$ lies on the graph of $g(x)$. Show that $b = 4$.

Q45 Girraween 2022 Trial Q5 · **1 mark**

The graph of the curve $y = (x + a)^2 + b$ is shown below.

Diagram to be inserted:
`adv-working-with-functions-d4-q45.png`

What are the values of a and b?

(A) $a = 2,\ b = 1$

(B) $a = -2,\ b = -1$

(C) $a = -2,\ b = 1$

(D) $a = 2,\ b = -1$

Q46 North Sydney Girls 2022 Prelim Q30(a) · **2 marks**

A parabola with equation $y = f(x)$ has a vertex at $(-1, 3)$ and passes through the origin. Write an equation for $f(x)$.

Q47 Fort St 2023 Trial Q20 · **3 marks**

The function $P(x) = x^3 + bx^2 + cx + d$ has x-intercepts at 3, 0 and -3. Find b, c and d.

Q48 Knox 2022 Trial Q20 · **3 marks**

A basketball player shoots a ball from a height of 2 metres into a hoop 14 metres away. The hoop is 3 metres from the ground. After moving 5 metres horizontally, the ball reaches a height of 4 metres from the ground. The path of the ball can be modelled by the quadratic function

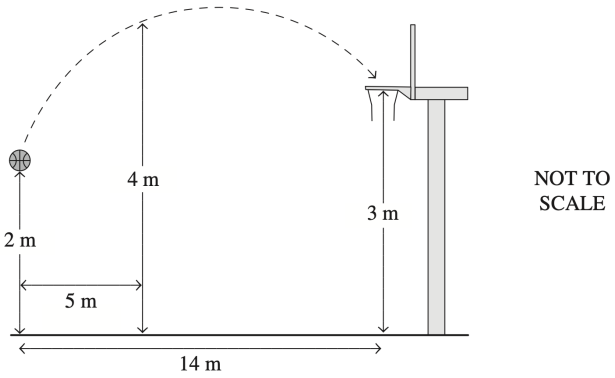
$$y = ax^2 + bx + c,$$

where y represents the height of the ball from the ground, x is the horizontal displacement from the basketball player, and a, b and c are constants. Find the values of a, b and c that best model the path of the ball.

Diagram to be inserted:
`adv-working-with-functions-d4-q48.png`

Q49 Penrith 2024 Trial Q14 · **3 marks**

The graph of a polynomial of degree 6 is shown below. It has x-intercepts at $(-1, 0)$, $(1, 0)$ and $(4, 0)$, and a y-intercept at $(0, 8)$.



Find the equation of the polynomial.

Intersections and features

7. Intersections and simultaneous equations (line-and-curve / two curves)

Q50 Hurlstone 2023 Trial Q19(a) · **2 marks**

Find the coordinates where the line $y = 2x - 3$ intersects the parabola $y = x^2 - 2x - 3$.

Q51 2024 HSC Q14(a) · **1 mark**

The curves $y = (x - 1)^2$ and $y = 5 - x^2$ intersect at two points. Find the x-coordinates of the points of intersection of the two curves.

Diagram to be inserted:
`adv-working-with-functions-d4-q51.png`

Q52 Cherrybrook Tech 2021 Prelim Q16 · **3 marks**

Use algebra to solve the following simultaneous equations:

$$y = x - 2$$

$$y^2 + x^2 = 10$$

Q53 Loreto Kirribilli 2022 Prelim Q35(b) · **3 marks**

The line $y = x + 5$ is a tangent to the curve $y = x^2 - 5x + 14$. Find the coordinates of the point where the tangent touches the curve.

Q54 2020 HSC Q30(a) · **2 marks**

Two parabolas $y = 4x - x^2$ and $y = ax^2$, where $a > 0$, intersect at the origin O and at a point A. Show that the x-coordinate of A is $\dfrac{4}{a+1}$.

Diagram to be inserted:
`adv-working-with-functions-d4-q54.png`

Q55 Killara 2022 Prelim Q22 · **3 marks**

Determine the number of points of intersection between the following graphs:

$$y = 3x^2 + 7x + 4$$

$$y = -x^2 + 1$$

8. Domain, range, extreme values and polynomial language

Q56 Sydney Tech 2023 Trial Q14(a) · **1 mark**

A polynomial function $f(x) = x^3 - 5x^2 + 8x - 3$ is defined over the domain $0 \leq x \leq 4$. What is the degree of this polynomial?

Q57 St George Girls 2022 Prelim Q11 · **2 marks**

State the domain and range of $y = 1 - 2x^2$.

Q58 North Sydney Girls 2022 Prelim Q18 · **2 marks**

Find the minimum value of the quadratic function $k(x) = 2x^2 - 5x + 18$.

Q59 Kambala 2024 Prelim Q8 · **1 mark**

For the polynomial $p(x) = 3x(x+4)(x+5)(x-1)(x-7)$, which statement is true?

(A) The degree of $p(x)$ is 5.

(B) The constant term of $p(x)$ is -140.

(C) The leading coefficient is 10.

(D) $p(x)$ has a zero at $x = 5$.

Q60 Killara 2023 Trial Q6 · **1 mark**

A function is defined as $f(x) = x^2 - 6x + 10$ for $x \in [-1, 3)$. What is its range?

(A) $y \in (1, \infty)$

(B) $y \in [1, \infty)$

(C) $y \in (1, 17]$

(D) $y \in [1, 17]$

Q61 Abbotsleigh 2024 Prelim Q5 · **1 mark**

Let $f(x) = x^2 + ax$, where a is a constant and $f(10) = f(2)$. Which of the following statements is true?

(A) $f\left(\frac{1}{2}\right) < f(1) < f(3)$

(B) $f(1) < f\left(\frac{1}{2}\right) < f(3)$

(C) $f(1) < f(3) < f\left(\frac{1}{2}\right)$

(D) $f(3) < f(1) < f\left(\frac{1}{2}\right)$