Year 11 Mathematics Extension 1

Topic: Further Functions (4 of 5)
Review Questions: Parametric Form
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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5. Matching a parametric curve to its graph
6. Sketching a parametric curve
7. Points and intersections on a parametric curve

Converting between parametric and Cartesian

1. Eliminate the parameter: lines and parabolas

Q1 2023 HSC Q11(a) · **2 marks**

The parametric equations of a line are given below.

$$x = 1 + 3t, \qquad y = 4t.$$

Find the Cartesian equation of this line in the form $y = mx + c$.

Q2 2023 Penrith Prelim Q1 · **1 mark**

Find the Cartesian equation for the curve with the parametric equations

$$x = 4p - 6, \qquad y = 3p.$$

(A) $y = \frac{1}{12}x + \frac{1}{2}$

(B) $y = \frac{3}{4}x + \frac{9}{2}$

(C) $y = \frac{1}{12}x - \frac{1}{2}$

(D) $y = \frac{3}{4}x + 6$

Q3 2021 Girraween Prelim Q3(c) · **2 marks**

A function is described by the parametric equations

$$x = t + 1, \qquad y = t^2 - 1.$$

Find the Cartesian equation of this function.

Q4 2024 Baulkham Hills Prelim Q2 · **1 mark**

A parabola has the parametric equations $x = t - 2$ and $y = 2t^2 - 1$. What is the Cartesian equation of the parabola?

(A) $y = 2x^2 + 4x - 1$

(B) $y = 2x^2 + 4x + 1$

(C) $y = 2x^2 + 8x - 7$

(D) $y = 2x^2 + 8x + 7$

Q5 2020 Baulkham Hills Prelim Q11(a) · **2 marks**

The parametric equations of a curve are $x = 4 - t$, $y = (1 - t)^2$. Find the Cartesian equation of the curve, simplifying your answer.

Q6 2024 Sydney Girls Trial Q4 · **1 mark**

The parametric equations of a curve are $x = 1 + t$ and $y = \dfrac{1 - t}{1 + t}$. What is the Cartesian equation of the curve?

(A) $y = \dfrac{2}{x} - 1$

(B) $y = \dfrac{1}{x} - 2$

(C) $y = \dfrac{1}{x} + 2$

(D) $y = \dfrac{2}{x} + 1$

Q7 2025 Baulkham Hills Trial Q12(b) · **2 marks**

The parametric equations of a curve are given below.

$$x = t^2 + 6t - 16, \qquad y = 6\ln(t + 3).$$

Find the Cartesian equation of this curve in the form $y = a\ln(x + b)$.

2. Parametric circles

Q8 2022 Gosford Prelim Q3(d) · **1 mark**

Find the Cartesian equation of the circle with parametric equations

$$x = 13\cos t, \qquad y = 13\sin t.$$

Q9 2020 Baulkham Hills Prelim Q2 · **1 mark**

The parametric equations $x = 3+4\cos\theta$, $y = 4\sin\theta - 4$ represent a circle, with centre C and radius r. Which of the following shows the correct centre and radius?

(A) $C(-3,4)$ and $r = 4$

(B) $C(3,-4)$ and $r = 4$

(C) $C(-3,4)$ and $r = 16$

(D) $C(3,-4)$ and $r = 16$

Q10 2024 Girraween Trial Q9 · **1 mark**

A curve is represented by the following parametric equations:

$$x = 2\cos\theta, \qquad y = 2\sin\theta.$$

Which of the following is the Cartesian equation of the curve?

(A) $x + y = 2$

(B) $x + y = 4$

(C) $x^2 + y^2 = 2$

(D) $x^2 + y^2 = 4$

Q11 2025 Penrith Trial Q14(a) · **2 marks**

Find the Cartesian form of the equation for $x = -2 + 5\cos\theta$, $y = 4 + 5\sin\theta$ and describe its shape.

Q12 2022 Glenwood Prelim Q7(c) · **3 marks**

Find the Cartesian equation of the circle with the parametric equations

$$x = 10 + 4\cos\theta \qquad \text{and} \qquad y = -8 + 4\sin\theta.$$

Q13 2020 Fort St Prelim Q8(c) · **4 marks**

A curve has parametric equations $x = 4\sin t + 3$ and $y = 4\cos t - 1$.

(i) Eliminate the parameter t and show that the curve is a circle and give its Cartesian equation. (2 marks)

(ii) Find the exact co-ordinates of the point on the curve where $t = \dfrac{\pi}{4}$. (2 marks)

3. Expressing a curve in parametric form

Q14 2023 Penrith Trial Q12(c) · **3 marks**

A circle has the equation $x^2 - 4x + y^2 + 8y + 11 = 0$.

(i) Show that it can be written in the form $(x-2)^2 + (y+4)^2 = 9$. **(1 mark)**

(ii) Express the circle in parametric form. **(2 marks)**

Q15 2022 Manly Trial Q1 · **1 mark**

Which of the following parametric equations represents a circle that passes through the origin?

(A) $x = 3 + 3\cos\theta, \quad y = 4 + 3\sin\theta$

(B) $x = 3 + 4\cos\theta, \quad y = 4 + 4\sin\theta$

(C) $x = 3 + 5\cos\theta, \quad y = 4 + 5\sin\theta$

(D) $x = 3 + 7\cos\theta, \quad y = 4 + 7\sin\theta$

Q16 2023 Penrith Prelim Q10 · 1 mark

The Cartesian equation $y = 2x^2 - 5x + 3$ is being converted to parametric equations with $x = 5 - 3m$. Find the parametric equation for y in terms of m.

(A) $y = 18m^2 - 15m + 28$

(B) $y = 18m^2 - 45m + 28$

(C) $y = 18m^2 + 15m + 28$

(D) $y = 18m^2 + 45m + 28$

Q17 2020 James Ruse Prelim Q4 · 1 mark

A possible set of parametric equations for the curve $4x^2 + y^2 = 24x - 2y - 33$ is

(A) $x = 3 - \sin t, \quad y = 1 + 2\cos t$

(B) $x = 3 + \sin t, \quad y = -1 + 2\cos t$

(C) $x = 2 + \sin t, \quad y = 1 + 2\cos t$

(D) $x = -3 + \sin t, \quad y = 1 + 2\cos t$

Q18 2024 Knox Trial Q3 · 1 mark

Which of the following parametric equations represents a parabola with a minimum at $(0, 2)$?

(A) $x = t - \dfrac{1}{t}, \quad y = 2t^2 + \dfrac{2}{t^2}$

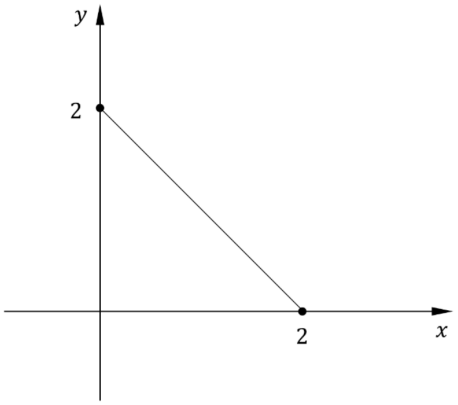
(B) $x = 2t + \dfrac{2}{t}, \quad y = t^2 + \dfrac{1}{t^2}$

(C) $x = 2t - \dfrac{2}{t}, \quad y = t^2 + \dfrac{1}{t^2}$

(D) $x = 2t - \dfrac{2}{t}, \quad y = t^2 - \dfrac{1}{t^2}$

Q19 2025 Barker Trial Q8 · **1 mark**

The diagram shows the interval from $(0, 2)$ to $(2, 0)$. Which pair of parametric equations does **not** represent the interval shown?



(A) $x = 2(1 - t^2),\ \ y = 2t^2 \quad$ for $0 \le t \le 1$

(B) $x = e^t - 1,\ \ y = 3 - e^t \quad$ for $0 \le t \le \ln 2$

(C) $x = 2\sin t,\ \ y = 2 - 2\sqrt{1 - \cos^2 t} \quad$ for $0 \le t \le \dfrac{\pi}{2}$

(D) $x = 2 - \dfrac{2}{\pi}\cos^{-1} t,\ \ y = \dfrac{2}{\pi}\cos^{-1} t \quad$ for $-1 \le t \le 1$

4. Harder eliminations: trig identities and reciprocals

Q20 2020 Hornsby Girls Trial Q9 · **1 mark**

A curve C has parametric equations $x = \cos^2 t$ and $y = 4\sin^2 t$ for $t \in \mathbb{R}$. What is the Cartesian equation of C?

(A) $y = 1 - x \quad$ for $0 \le x \le 1$

(B) $y = 4 - 4x \quad$ for $t \in \mathbb{R}$

(C) $y = 4 - 4x \quad$ for $0 \le x \le 1$

(D) $y = 1 - x \quad$ for $t \in \mathbb{R}$

Q21 2024 Glenwood Prelim Q8(b)(i) · **1 mark**

The parametric equations of a particle are $x = \sin t$ and $y = \cos 2t$, where t is the time in seconds. Find the Cartesian equation.

Q22 2021 North Sydney Boys Trial Q11(a) · 1 mark

Find the Cartesian equation represented by $x = \cos t + \sin t$ and $y = \cos t - \sin t$.

Q23 2023 Sydney Tech Trial Q7 · 1 mark

The parametric equation of a function is given by $x = \sin t$ and $y = \sin 2t$. What is its Cartesian equation?

(A) $y = 2x\sqrt{1-x^2} \quad \{0 \leq x \leq 1\}$

(B) $y = 2x^2 - 1 \quad \{0 \leq x \leq 1\}$

(C) $y = 1 - 2x^2 \quad \{0 \leq x \leq 1\}$

(D) $y = \dfrac{x+1}{2} \quad \{0 \leq x \leq 1\}$

Q24 2020 James Ruse Prelim Q3 · 1 mark

A function is given by the parametric equations $x = t + \dfrac{1}{t}$, $y = t^3 + \dfrac{1}{t^3}$. Its Cartesian equation is

(A) $y = x^3 - 3x$

(B) $y = x^3 + 3x$

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

(D) $y = x^3$

Q25 2022 Trinity Grammar Trial Q9 · 1 mark

A curve is defined parametrically by $x = \sec t + 1$ and $y = \tan t$ where $t \in \left[0, \dfrac{\pi}{2}\right)$. Which of the following statements is correct for the Cartesian equation and domain of the curve?

(A) $y = \sqrt{x^2 - 2x}, \ x \in [2, \infty)$

(B) $y = \sqrt{x^2 - 2x}, \ x \in (-\infty, 0] \cup [2, \infty)$

(C) $y^2 = x^2 - 2x, \ x \in [2, \infty)$

(D) $y^2 = x^2 - 2x, \ x \in (-\infty, 0] \cup [2, \infty)$

Q26 2022 Girraween Prelim Q6(b) · 4 marks

A curve is represented by the following parametric equations $x = 5\tan\theta - 3$, $y = 9 + 4\sec\theta$. Find the Cartesian equation of the curve.

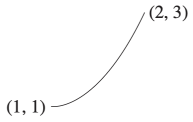
Graphing and using parametric curves

5. Matching a parametric curve to its graph

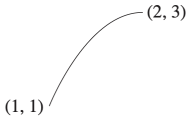
Q27 2022 HSC Q5 · **1 mark**

A curve is defined in parametric form by $x = 2 + t$ and $y = 3 - 2t^2$ for $-1 \leq t \leq 0$. Which diagram best represents this curve?

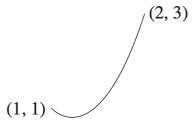
A.



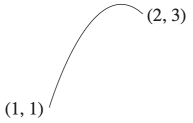
B.



C.



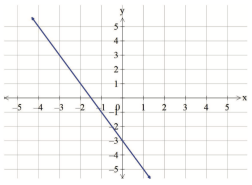
D.



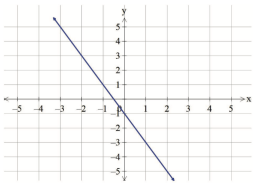
Q28 2022 Ascham Trial Q1 · **1 mark**

What is the graph of the function which has parametric equations $x = -\frac{p}{2} - 1$ and $y = p + 1$?

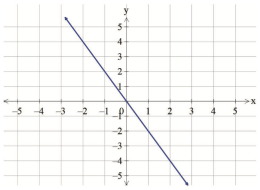
A.



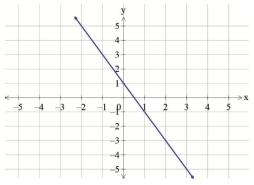
B.



C.



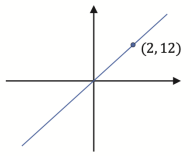
D.



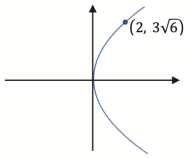
Q29 2022 Hunters Hill Trial Q4 · **1 mark**

A function is defined by the parametric equations $x = 3t^2$ and $y = 9t$, for $t > 0$. Which of the following sketches represents this function?

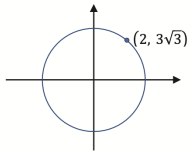
(A)



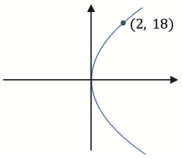
(B)



(C)



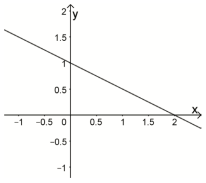
(D)



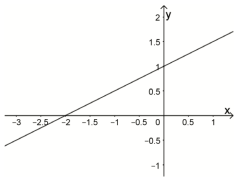
Q30 2023 Blacktown Boys Prelim Q3 · **1 mark**

The graph of the function which has parametric equations $x = -2t$ and $y = 1 + t$ is

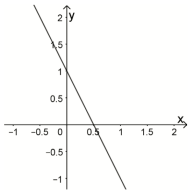
A.



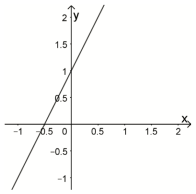
B.



C.

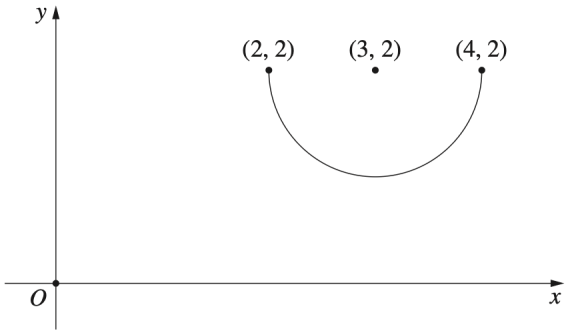


D.



Q31 2021 HSC Q8 · **1 mark**

The diagram shows a semicircle. Which pair of parametric equations represents the semicircle shown?



(A) $x = 3 + \sin t, \quad y = 2 + \cos t \quad \text{for } -\frac{\pi}{2} \leq t \leq \frac{\pi}{2}$

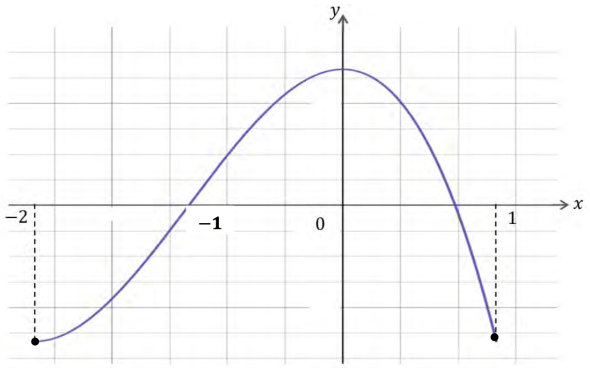
(B) $x = 3 + \cos t, \quad y = 2 + \sin t \quad \text{for } -\frac{\pi}{2} \leq t \leq \frac{\pi}{2}$

(C) $x = 3 - \sin t, \quad y = 2 - \cos t \quad \text{for } -\frac{\pi}{2} \leq t \leq \frac{\pi}{2}$

(D) $x = 3 - \cos t, \quad y = 2 - \sin t \quad \text{for } -\frac{\pi}{2} \leq t \leq \frac{\pi}{2}$

Q32 2023 St George Girls Trial Q8 · **1 mark**

A parametric function is graphed below. Which of the following shows the parametric equations of the curve above for $-1 \leq t \leq 2$?



(A) $x = t - 1$ and $y = 3t - t^3$

(B) $x = t + 1$ and $y = 3t - t^3$

(C) $x = t + 1$ and $y = -3t + t^3$

(D) $x = t - 1$ and $y = 3t + t^3$

6. Sketching a parametric curve

Q33 2022 Gosford Prelim Q5(b)(i) · **2 marks**

Sketch the parabola whose parametric equations are $x = t$ and $y = t^2$. On your diagram, mark the points P and Q which correspond to $t = -1$ and $t = 2$ respectively.

Q34 2022 Hurlstone Prelim Q13(c)(i) · **2 marks**

The parametrisation of a circle is given by $x - 2 = 2\cos\theta$ and $y = 2\sin\theta$. Sketch the graph of this circle, labelling its centre and any points where the graph cuts the x and/or y axes.

Q35 2023 Presbyterian Ladies College Prelim Q11(d) · **5 marks**

A curve in the xy-plane is defined parametrically by $x = 8t$ and $y = 4t^2$, where t is the parameter.

(i) Draw the curve for $-3 \leq t \leq 3$, showing the coordinates of the endpoints and any intercepts. (2 marks)

(ii) For what value(s) of t will the curve intersect the line $y = 10 - \dfrac{3}{4}x$? (3 marks)

Q36 2020 International Grammar Prelim Q12(d) · **5 marks**

A curve in the xy-plane is defined parametrically by $x = 4t^2$ and $y = 8t$, where t is the parameter.

(i) Draw the curve for $-3 \leq t \leq 3$, showing the beginning and ending coordinates and any intercepts. (2 marks)

(ii) For what value or values of t will the parabola intersect the line $y = 6 - 2x$? (3 marks)

Q37 2024 Ascham Trial Q14(b) · **3 marks**

Sketch the function represented by the parametric equations

$$x = 2t - 1, \qquad y = t^2 + t, \qquad -1 \leq t \leq 1.$$

7. Points and intersections on a parametric curve

Q38 Hurlstone 2025 Prelim Q1 · **1 mark**

Consider the parametric equations

$$x = 3t, \qquad y = -3t^2.$$

The point $(-6, m)$ lies on the curve. Which of the following gives the value of m?

(A) $m = -12$

(B) $m = -2$

(C) $m = 2$

(D) $m = 12$

Q39 Merewether 2025 Trial Q8 · **1 mark**

The point $P(4, a)$ is on the graph of the parametric equations $x = \dfrac{t}{2}$, $y = 2\sqrt{t}$. There is another point $F(2, 0)$, such that $|PF|$ is which of the following?

(A) 4

(B) 5

(C) 6

(D) 7

Q40 Cherrybrook Tech 2021 Trial Q7 · **1 mark**

A curve is defined parametrically by $x = -\ln t$, $y = \cos 2t$ for $t > 0$. At what approximate value of x does the curve cross the x-axis for the first time as t increases from zero?

(A) -1.7

(B) -1.37

(C) -0.86

(D) 0.24

Q41 Presbyterian (PLC Sydney) 2022 Prelim Q13(f) · **3 marks**

A curve is defined by the parametric equations

$$x = 3\cos t + 4 \qquad \text{and} \qquad y = 3\sin t - 5.$$

(i) The point $P(4, -2)$ lies on the curve. Find the value of t within the domain $[0, 2\pi]$ which corresponds to the point P. **(1 mark)**

(ii) Find the Cartesian equation which describes the curve. **(2 marks)**

Q42 Hurlstone 2021 Trial Q11(d) · **3 marks**

Two boats on a lake start sailing at the same time.

$$\text{Boat A moves on a course given by:} \qquad x = \frac{t}{2}, \qquad y = t + 1.$$

$$\text{Boat B moves on a course given by:} \qquad x = t - 2, \qquad y = 9 - 2t.$$

where t measures the time elapsed in hours from when the boats started.

(i) Find the Cartesian equation for the course of each boat and show that the courses intersect at $(1, 3)$. **(2 marks)**

(ii) Do the boats collide? Justify your answer supported by calculations. **(1 mark)**