FREE SAMPLE: THE FIRST QUESTION

Question One (12 marks)

(a) A curve has gradient dy/dx = e^($\frac{x}{2}$) + 2 at every point, and it passes through the point (0, 2).

Find the equation of the curve, and find the y-value at x = 3 (3 significant figures).

[4 marks]

(b) Use a suitable substitution (or recognise the reverse chain rule) to find the exact value of

∫ from 0 to 1 of 4e^(x + 2) dx.

Then give the value to 3 significant figures.

[4 marks]

(c) At time t (t ≥ 0), a drug is released into the bloodstream at a rate of R = 2 + 3e^($\frac{-x}{2}$) mg per minute.

(i) Find the total amount in the first 5 units of time (use integration; 3 significant figures).

(ii) At what time has half of that total arrived? (3 significant figures)

[4 marks]

TEST PAPERS HUB - NOT FOR RESALE OR REDISTRIBUTION

THE WORKED ANSWER TO THAT QUESTION

Question 1 (12 marks) [Integrals and finding functions]

(a) A curve has gradient dy/dx = e^($\frac{x}{2}$) + 2 at every point, and it passes through the point (0, 2). Find the equation of the curve, and find the y-value at x = 3 (3 significant figures).

(a) Answer: y = 2x + 2e^($\frac{x}{2}$); y(3) = 15.0

- Evidence level: Merit (integrate the gradient and use a point on the curve to find the constant).
- y = ∫ (e^($\frac{x}{2}$) + 2) dx = 2x + 2e^($\frac{x}{2}$) + C.
- The curve passes through (0, 2): 2 = 2 + C, so C = 0.
- y = 2x + 2e^($\frac{x}{2}$).
- At x = 3: y = 15.0.

> **KEY TAKEAWAY**
> Finding a function: integrate the gradient, add C, then use the given point to find C; check by differentiating your answer.

(b) Use a suitable substitution (or recognise the reverse chain rule) to find the exact value of ∫ from 0 to 1 of 4e^(x + 2) dx. Then give the value to 3 significant figures.

(b) Answer: −4(−E + 1)e^(2) ≈ 50.8

- Evidence level: Merit (choose a substitution so the integrand becomes a standard integral).
- Let u = x + 2.
- Find an antiderivative: ∫ 4e^(x + 2) dx = 4e^(x + 2) + C.
- Evaluate between the limits: 4e^(3) − 4e^(2) = −4(−E + 1)e^(2).
- To 3 significant figures: 50.8.

> **KEY TAKEAWAY**
> Substitution: pick u so that du appears in the integrand (reverse chain rule); change the limits or go back to x, then evaluate F(b) − F(a) and show the antiderivative you used.

(c) At time t (t ≥ 0), a drug is released into the bloodstream at a rate of R = 2 + 3e^($\frac{-x}{2}$) mg per minute. (i) Find the total amount in the first 5 units of time (use integration; 3 significant figures). (ii) At what time has half of that total arrived? (3 significant figures)

(c) Answer: (i) 15.5; (ii) 1.99

- Evidence level: Merit (integrate a rate of change to find a total, then solve for a time).
- (i) Total = ∫ from 0 to 5 of R dt = [2x − 6e^($\frac{-x}{2}$)] from 0 to 5 = 15.5.
- (ii) We need ∫ from 0 to T of R dt = 7.75, that is 2T + 6 − 6e^(−T/2) = 7.75.
- Solving this equation numerically (a graphing calculator or solver) gives T = 1.99.

> **KEY TAKEAWAY**
> A rate integrates to a total: the area under the rate graph. To find when a given total is reached, set the integral from 0 to T equal to that total and solve for T.

LOS: Integrals and finding functions (91579)

TESTPAPERSHUB NOT FOR RESALE OR DISTRIBUTION

LIKED THIS SAMPLE?

The full paper is the real thing.

THIS FREE SAMPLE	THE FULL PAPER
A short extract: the opening questions of Paper 1, then their worked answers. 2 pages in all.	Three questions made of several multi-part problems answered in writing (constructed response, no multiple choice), with a worked solution for every part that shows whether it is aimed at Achieved, Merit or Excellence. 10 pages, with a worked solution for every question.

What you get with each paper

- A complete, timed paper in the real exam layout, not just a taste of it.
- A worked solution for every question: numbered steps, why each wrong option is wrong, and a key takeaway.
- 20 different papers in this set. Every one uses new questions, so each extra paper is new practice, not a repeat.
- An A4 PDF emailed straight after payment, made for printing.

Get Paper 1 now

A$11.99 one-off, instant PDF download. Tap or click here.

Or see all 20 NCEA Level 3 Calculus 91579 Integration papers:
testpapershub.com/collections/ncea-level-3-calculus-91579-integration/

Getting the most from a practice paper

1. Print it and set the timer shown on the cover. Answer every question before looking at any solution.
2. Mark it against the worked solutions and note the topics that cost you marks.
3. Retry the questions you missed a day later, then use the next paper to check the fix held.

Not sure which paper to start with, or have a question before you buy? Email support@testpapershub.com and a real person will reply, normally within one business day. These are original practice papers, not official past papers, and are not affiliated with any exam authority.