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NEW ZEALAND QUALIFICATIONS AUTHORITY
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SUPERVISOR'S USE ONLY

Level 3 Calculus, 2019

91579 Apply integration methods in solving problems

9.30 a.m. Tuesday 26 November 2019
 Credits: Six

Achievement	Achievement with Merit	Achievement with Excellence
Apply integration methods in solving problems.	Apply integration methods, using relational thinking, in solving problems.	Apply integration methods, using extended abstract thinking, in solving problems.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

Show ALL working.

Make sure that you have the Formulae and Tables Booklet L3–CALCF.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

TOTAL

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QUESTION ONE

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(a) Find $\int \left(2 + \frac{2}{\sqrt{x}} \right) dx$.

(b) Use the values given in the table below to find an approximation to $\int_2^5 f(x) dx$, using the Trapezium Rule.

x	2	2.5	3	3.5	4	4.5	5
$f(x)$	0.6	1.1	1.7	2.6	3.2	3.4	2.6

(c) Find $\int_0^{\frac{\pi}{12}} \cos 4x \cdot \cos 2x \, dx$.

You must use calculus and show the results of any integration needed to solve the problem.

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You must use calculus and show the results of any integration needed to solve the problem.

- $$\frac{dN}{dt} = kN$$

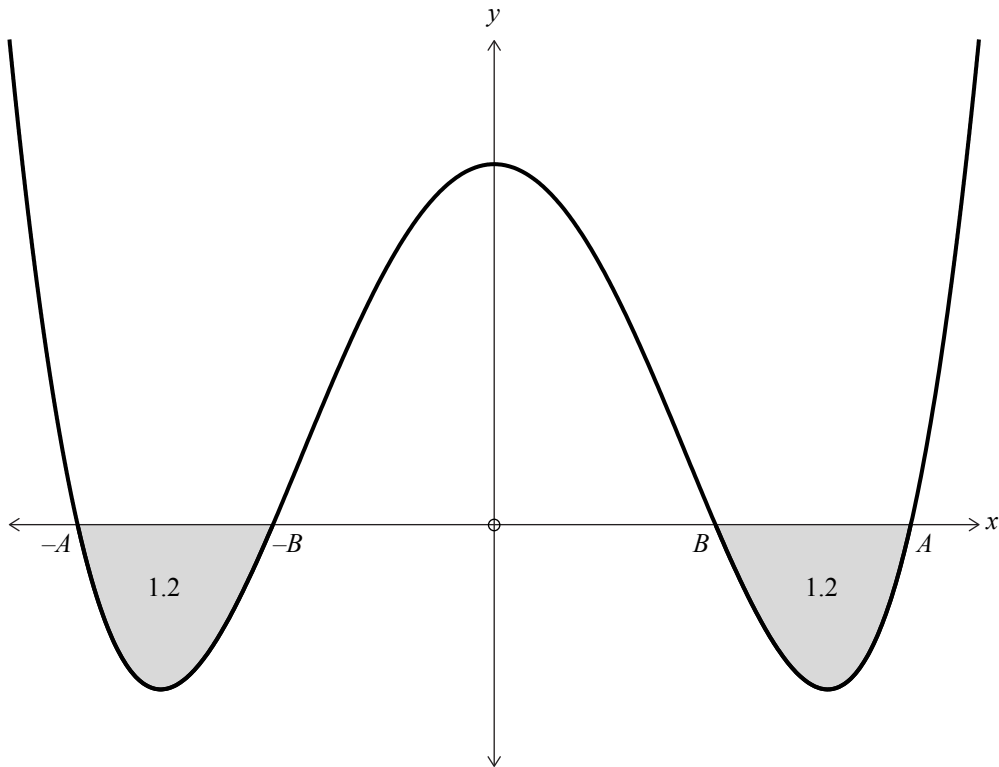
$$k = \frac{1}{t_1} \ln \left(\frac{N_2}{N_1} \right)$$

QUESTION TWO

ASSESSOR'S
USE ONLY

- (a) Find $\int (1 + 2e^{4x}) dx$.

- (b) The graph of $y = f(x)$ shown below has the y -axis as a line of symmetry. The areas of the shaded regions are shown.

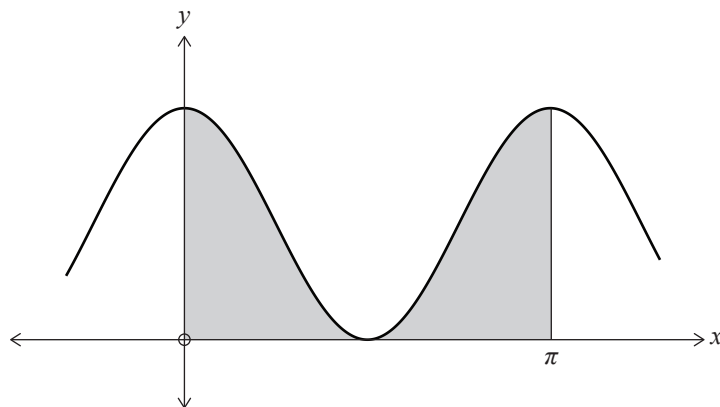


If $\int_{-A}^A f(x) dx = 5.8$, what is the value of $\int_{-B}^B f(x) dx$?

- (c) Find k such that $\int_3^k \frac{8}{2x-5} dx = 10$.

You must use calculus and show the results of any integration needed to solve the problem.

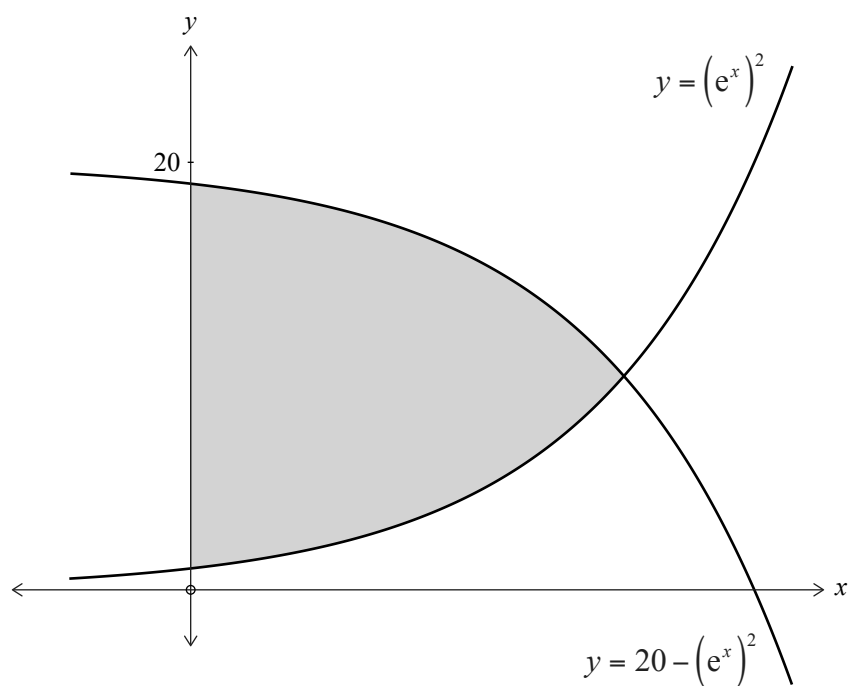
- (d) The diagram below shows the graph of the function $y = \cos^2 x$.



Find the area of the shaded region.

You must use calculus and show the results of any integration needed to solve the problem.

- (e) The diagram below shows the graphs of the functions $y = (e^x)^2$ and $y = 20 - (e^x)^2$.



Find the area of the region shaded in the diagram.

You must use calculus and show the results of any integration needed to solve the problem.

QUESTION THREE

ASSESSOR'S
USE ONLY

(a) Find $\int 24(2x-1)^3 dx$.

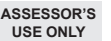
(b) Solve the differential equation $\frac{dy}{dx} = 4\sec^2 2x$, given that when $x = \frac{\pi}{8}$, $y = 5$.

(c) Find $\int_1^4 x + 1 + \frac{x}{x+1} dx$.

You must use calculus and show the results of any integration needed to solve the problem.

Calculus 91579, 2019

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Extra paper if required.
Write the question number(s) if applicable.

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