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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

SUPERVISOR'S USE ONLY

Level 3 Calculus, 2014

91579 Apply integration methods in solving problems

9.30 am Tuesday 18 November 2014

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 2–15 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

ASSESSOR'S USE ONLY

QUESTION ONE

ASSESSOR'S
USE ONLY

(a) Find $\int \left(\frac{2}{x} - \frac{3}{x^2} \right) dx$.

(b) Find the area enclosed between the graph of $y = 3 \sec^2 x$, the x -axis, and the lines $x = \frac{\pi}{6}$ and $x = \frac{\pi}{4}$.

Give the result of any integration needed to solve this problem.

(c) The velocity of an object is given by $v(t) = 5(4 - 3e^{-0.2t})$
 where t is the time in seconds since the timing started
 and v is the velocity in m s^{-1} .

What distance did the object move in the first 10 seconds of its timed motion?

Give the result of any integration needed to solve this problem.

- Give the result of any integration needed to solve this problem.

- Show that the area between the two curves is $\frac{1}{3}$.

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- A graph of a function $y = f(x)$ on a Cartesian coordinate system. The x-axis is labeled with k and π . The area under the curve is divided into two regions: A (light gray) from $x=0$ to $x=k$, and B (dark gray) from $x=k$ to $x=\pi$. The curve is concave down and passes through the origin.

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

QUESTION THREEASSESSOR'S
USE ONLY

- (a) Use the values given below to find an approximation to $\int_2^5 f(x) dx$, using Simpson's Rule.

x	2	2.5	3	3.5	4	4.5	5
$f(x)$	0.8	1.12	2.02	2.17	2.28	1.56	1.2

- (b) Find $\int (\sqrt[3]{x} + 6e^{3x-5}) dx$.

- The rate at which the temperature of the oven tray changes at any instant is proportional to the difference between the temperature of the oven tray and the room temperature at that instant.

- After 3 minutes its temperature is 100°C.

Give the result of any integration needed to solve this problem.

Calculus 91579, 2014

(d) Find $\int_4^9 \frac{18}{x\sqrt{x}} dx$.

Give the result of any integration needed to solve this problem.

ASSESSOR'S
USE ONLY

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

QUESTION
NUMBER

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