

91262



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

2

SUPERVISOR'S USE ONLY

Tick this box if
there is no writing
in this booklet

Level 2 Mathematics and Statistics 2020

91262 Apply calculus methods in solving problems

9.30 a.m. Thursday 19 November 2020
Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Apply calculus methods in solving problems.	Apply calculus methods, using relational thinking, in solving problems.	Apply calculus 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.

Make sure that you have Formulae Sheet L2–MATHF.

Show ALL working.

If you need more room for any answer, use the extra space provided at the back of this booklet.

You must show the use of calculus in answering all questions in this paper.

Check that this booklet has pages 2–16 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

- (a) A function is given by $f(x) = x^3 - 2x^2 + 5$.

Find the gradient of the graph at the point where $x = 4$.

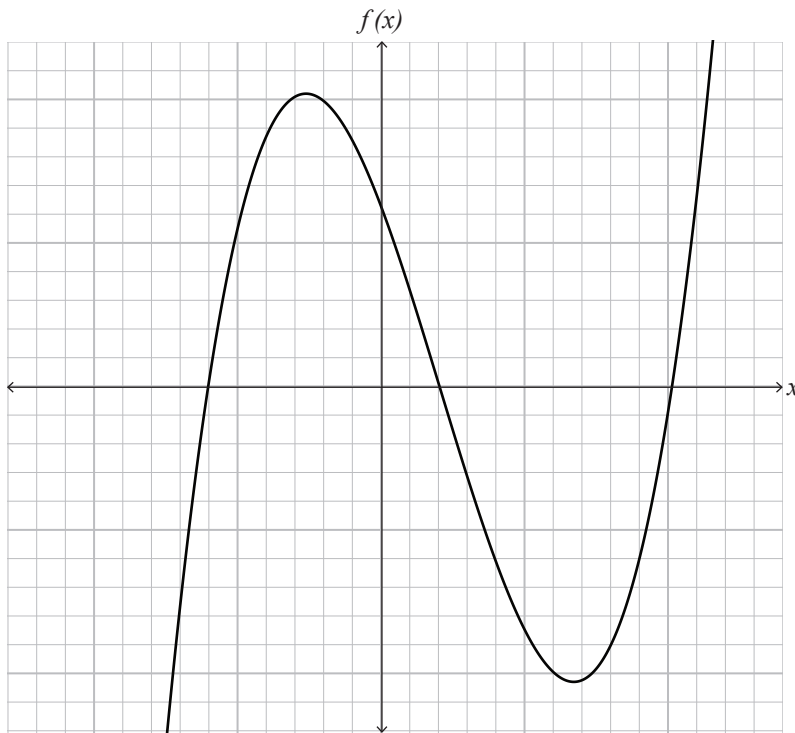
- (b) Another function is given by $h(x) = 0.5x^2 + 3x - 1$.

Find the x -coordinate of the point on the graph of this function where the gradient is 5.

- (c) Find the equation of the tangent to the curve of $y = x^2 + 5x$ at the point $(2, 14)$.

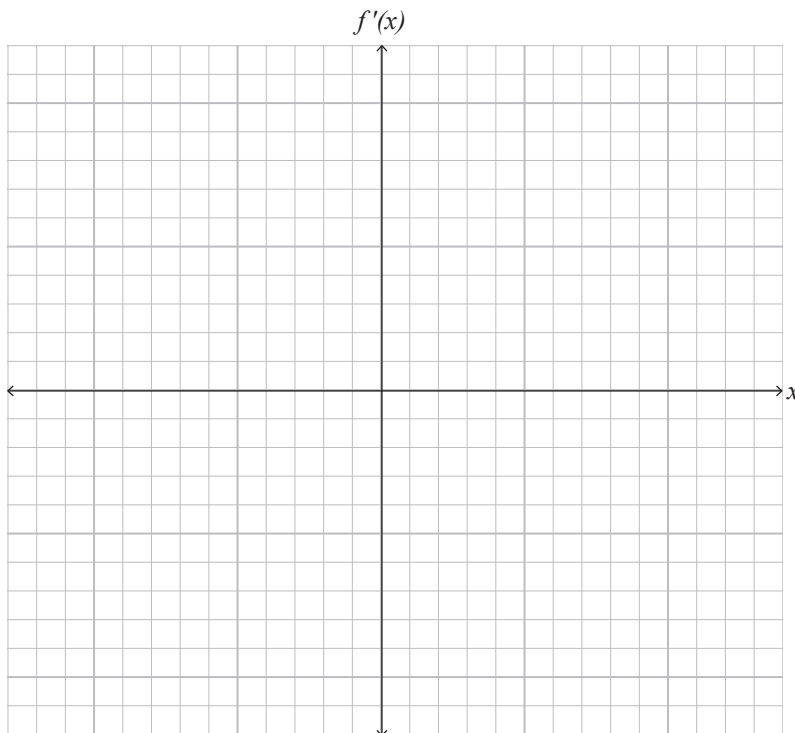
QUESTION TWO

- (a) The graph of a function $y = f(x)$ is shown on the axes below.



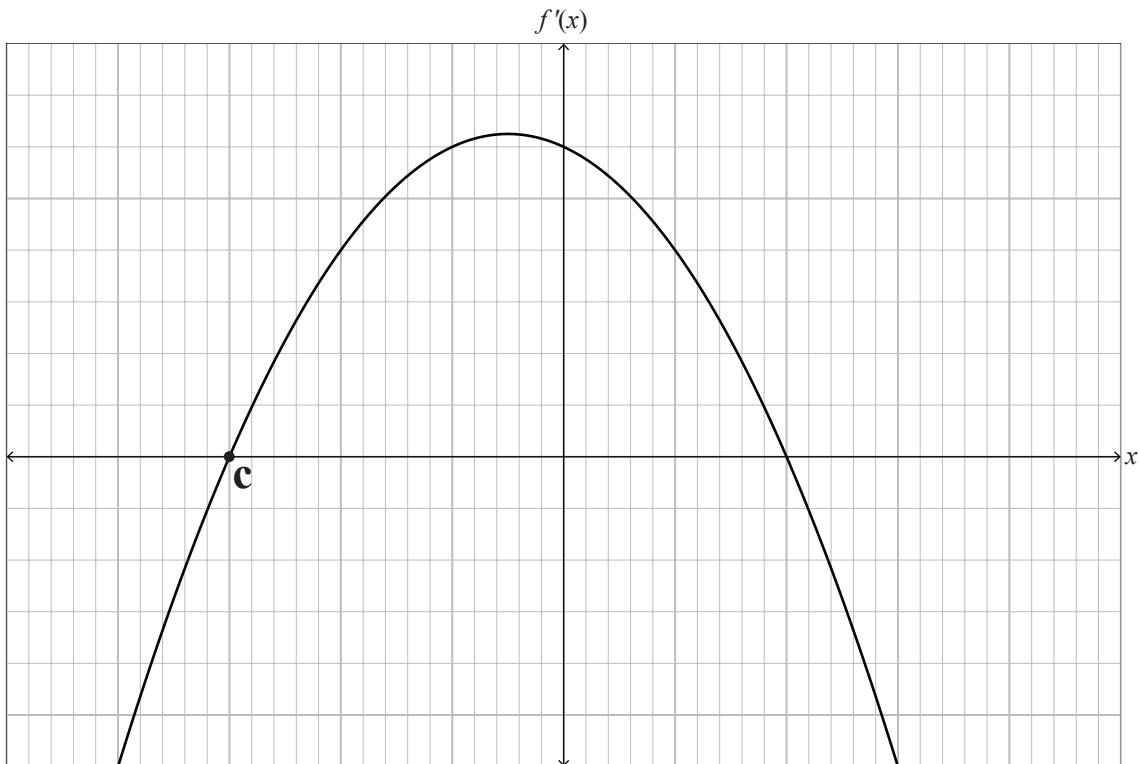
Sketch the graph of the gradient function $y = f'(x)$ on the axes below.

Both sets of axes have the same horizontal scale.



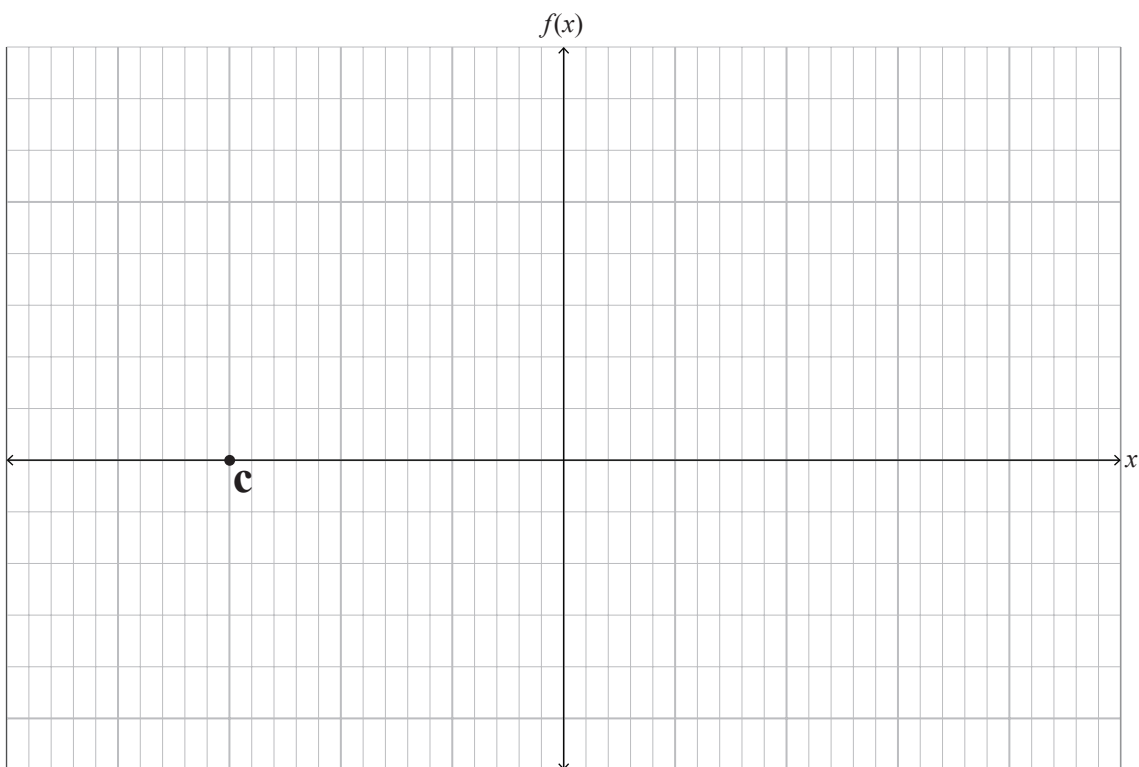
*If you need to
redraw this graph,
use the grid on
page 14.*

- (d) The graph of a gradient function, $f'(x)$, is shown on the axes below. The point $(c,0)$ is on this graph.



Sketch the graph of the function $f(x)$ on the axes below, given that $f(c) = 0$.

Both sets of axes have the same horizontal scale.



*If you need to
redraw this graph,
use the grid on
page 15.*

QUESTION THREE

- (a) $f'(x) = 3x^2 - 2x - 4$ is the derivative of a function f .

The graph of $f(x)$ passes through the point $(3,10)$.

Find an expression for $f(x)$.

- (b) A whale surfaces on a still sea. As the whale surfaces, a circular ripple expands outwards at a constant speed, so that the radius of the circle is given by $r = 0.7t$ metres t seconds after the whale surfaces.

At what rate is the area of water within the circular ripple increasing, 20 seconds after the whale surfaces?

- (d) The function $f(x) = kx^3 + 9x$ has a tangent with a gradient of 15 where $x = 2$.

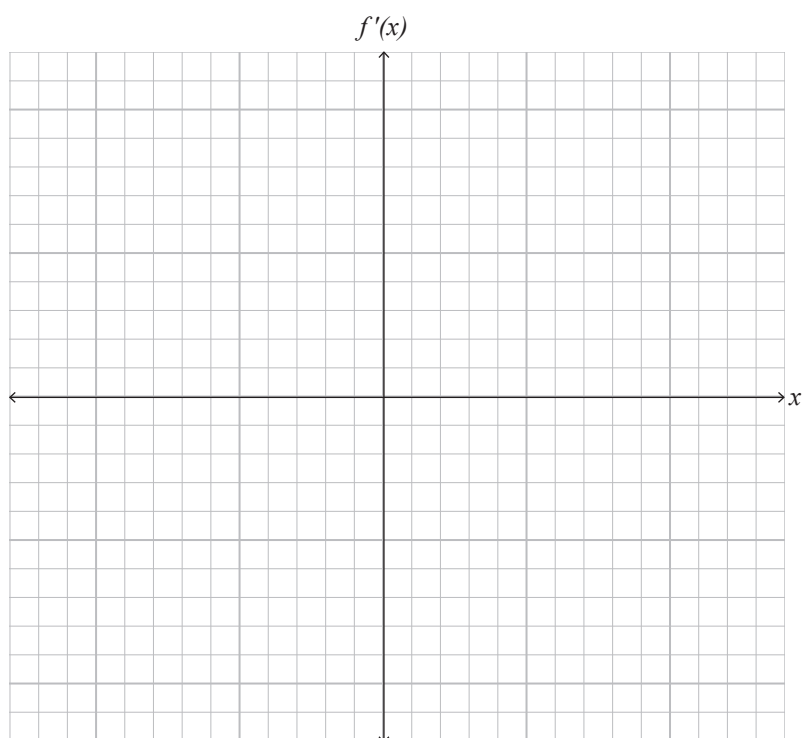
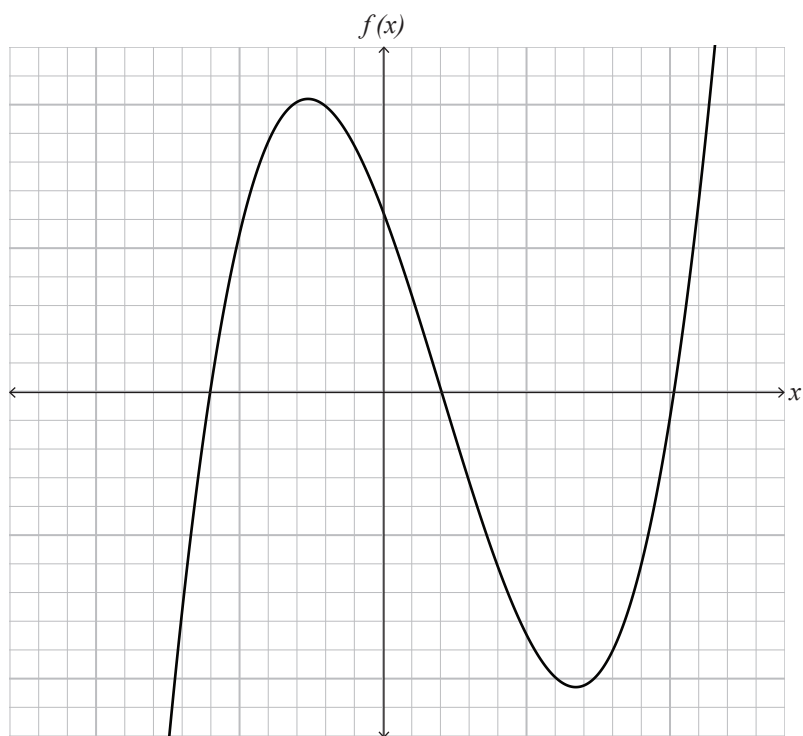
Find the value of k .

Please turn over ➤

SPARE GRIDS

If you need to redo Question Two (a), use the grid below. Make sure it is clear which answer you want marked.

(a)



If you need to redo Question Two (d), use the grid below. Make sure it is clear which answer you want marked.

ASSESSOR'S
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(d)

