



SUPERVISOR'S USE ONLY

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translation of this cover

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91262M



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Tuhia he (X) ki te pouaka mēnā
kāore koe i tuhi kōrero ki tēnei puka



+



Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Te Pāngarau me te Tauanga, Kaupae 2, 2023

91262M Te whakamahi tikanga tuanaki i te whakaoti rapanga

Ngā whiwhinga: E rima

Paetae	Kaiaka	Kairangi
Te whakamahi tikanga tuanaki i te whakoti rapanga.	Te whakamahi tikanga tuanaki i te whakoti rapanga, mā te whakaaro ā-pānga.	Te whakamahi tikanga tuanaki i te whakoti rapanga, mā te whakaaro waitara e whānui ana.

Tirohia kia kitea ai e rite ana te Tau Ākonga ā-Motu (NSN) kei runga i tō puka whakauru ki te tau kei runga i tēnei whārangi.

Me whakamātau koe i ngā tūmahi KATO A kei roto i tēnei pukapuka.

Whakaaturia ngā whiriwhiringa KATO A.

Tirohia kia kitea ai kei a koe te Pepa Ture Tātai L2–MATHMF.

Ki te hiahia wāhi atu anō koe mō ō tuhinga, whakamahia ngā whārangi kei muri o tēnei pukapuka.

Tirohia kia kitea ai e tika ana te raupapa o ngā whārangi 2–23, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

Kaua e tuhi ki tētahi wāhi e kitea ai te kauruku whakahāngai (©). Ka poroa taua wāhanga ka mākahia ana te pukapuka.

HOATU TE PUKAPUKA NEI KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.

(a) Ko te pānga, ko f , e whakaataria ana ki te whārite o $f(x) = 4x^2 - 12x$.

(a) A function f is given by $f(x) = 4x^2 - 12x$.

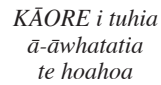
Find the point on the curve where the gradient of $f(x)$ is equal to 4.

- (b) Find the function whose gradient function is $f'(x) = 4x^3 - 6x^2 - 4x$, and which passes through the point $(2, -5)$.

$$f(x) = \frac{x^4}{4} - \frac{2x^3}{3} - 12x^2 + 10.$$

- $$f(x) = \frac{x^4}{4} - \frac{2x^3}{3} - 12x^2 + 10 \text{ is increasing.}$$

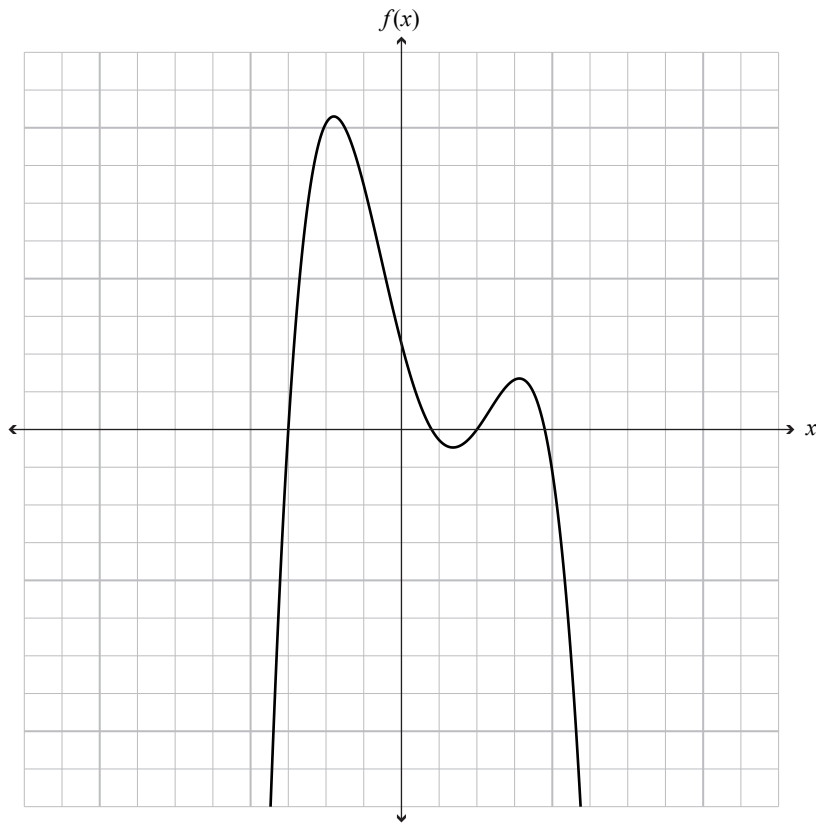
- E whakaaturia ana i raro nei ngā tauira e toru o ētahi whirihoranga e taea ana mō te whīra:



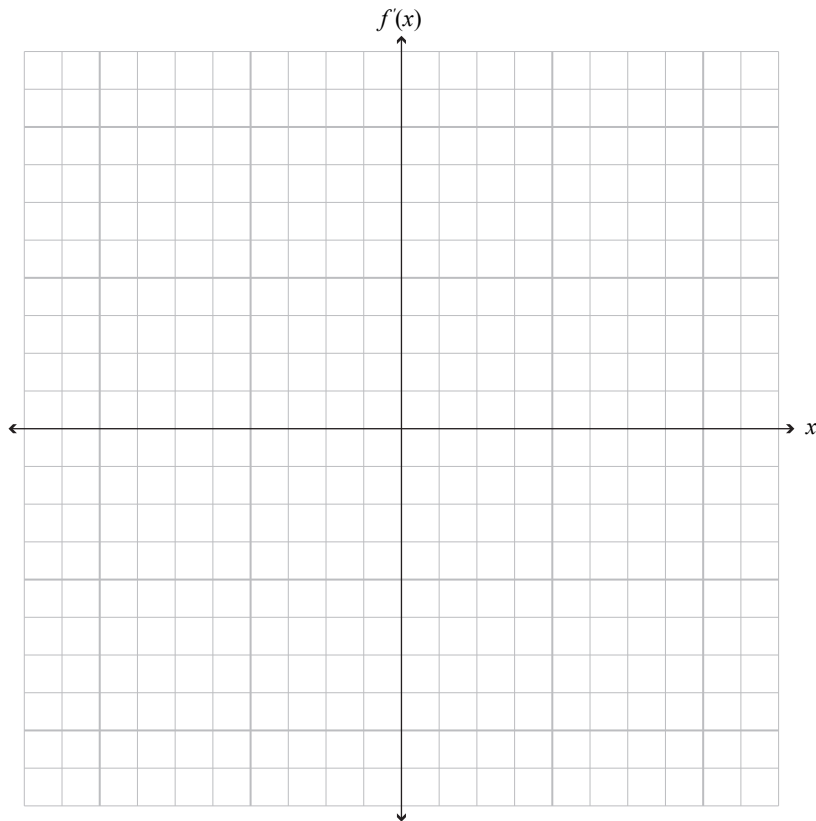
Whakamahia ngā tikanga tuanaki hei whakaatu atu i te ekenga o tērā hei mōrahi.

TE TŪMAHI TUARUA

- (a) E whakaaturia ana i te hoahoa i raro nei te kauwhata o tētahi pānga, $y = f(x)$.



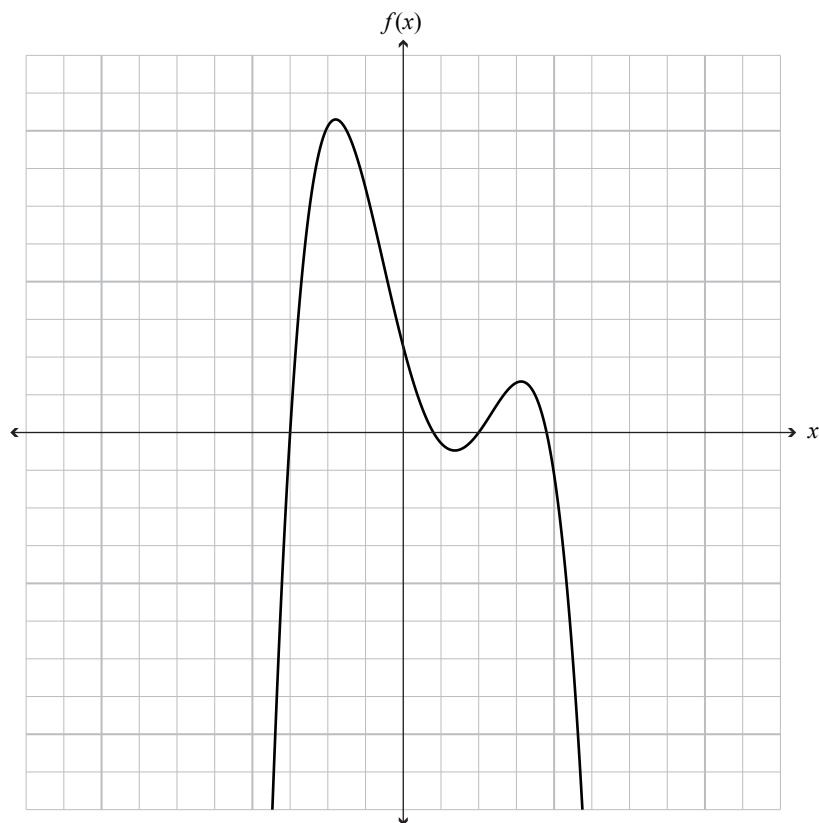
- I ngā tuaka kei raro nei, huahuatia te kauwhata o te pānga rōnaki, $y = f'(x)$.



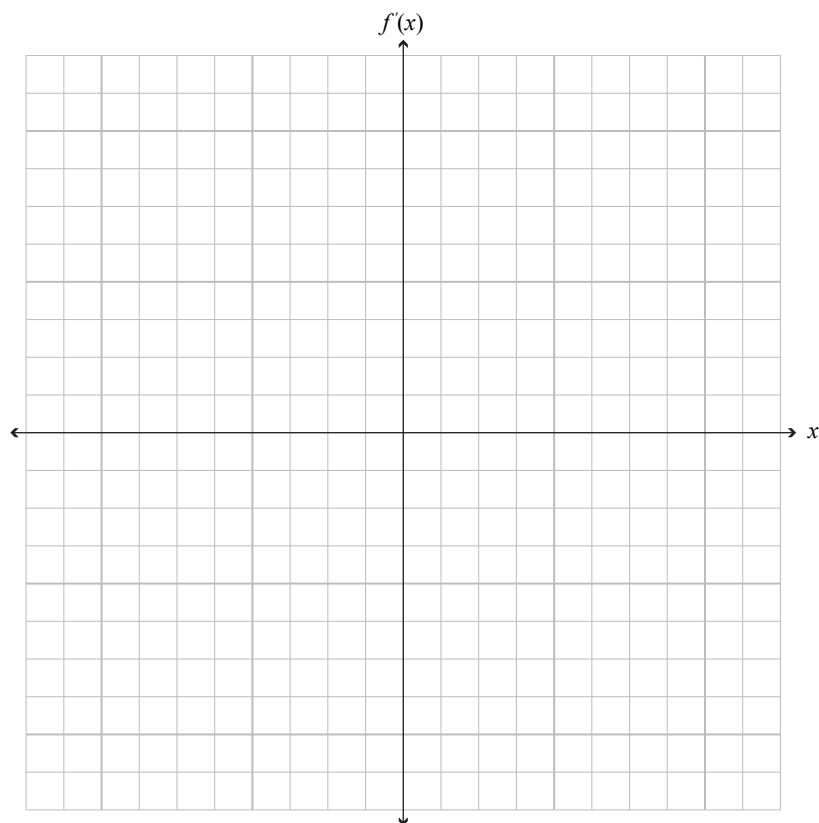
Ki te hiahia koe
ki te tā anō i
tō kauwhata,
whakamahia te
tukutuku kei te
whārangi 20.

QUESTION TWO

- (a) The diagram below shows the graph of a function $y = f(x)$.



On the axes below, sketch the graph of the gradient function $y = f'(x)$.



If you need to redraw your graph, use the grid on page 21.

- (i) Ka pēhea te roa o tē haere a te waka i mua i tōna tūnga?

- (c) A new car is travelling at 27.78 m s^{-1} (100 km/hr), when the driver sees an obstruction in the road ahead. The driver applies the brakes, and decelerates at a rate of 2.5 m s^{-2} .

- Mēnā e 2.1 m s^{-2} noa te pōturi haeretanga e taea ana e tētahi waka tawhito ake, i te āhua o ana pereki, he aha te tere mōrahi o te haere a te waka e tū tonu ai te waka i taua tawhiti tonu (i tōna 154 m), pērā i te waka hou i whakaahuatia rā i te wāhanga (ii)?

- If an older car's brakes were only able to allow for a deceleration of 2.1 m s^{-2} , what is the highest speed in which the car should be travelling so that it is able to come to a complete stop in the same distance (approx. 154 m) as the new car described in part (ii).

TE TŪMAHI TUATORU

- (a) (i) Whiriwhiria te rōnaki o te kōpiko $y = 2x^3 - 9x^2 + 12x + 3$ i te pūwāhi o $(1,8)$.

- (ii) Whiriwhiria ngā taunga o tētahi atu pūwāhi i te kōpiko e rite ana te rōnaki ki tērā o te wāhanga (i).

- (b) Ka taea te whakatauiria te tokomaha o te apataki o tētahi pūkete pāhopori i tēnei:

$$F = 5t^3 - 840t^2 + 42180t \quad (0 \leq t \leq 90)$$

Arā, ko t ngā rā i muri i te whakaritenga o te pūkete, ā, ko F te tokomaha o te apataki.

- (i) He aha te pāpātanga o te piki haeretanga o te tokomaha o te apataki i te rā tuarima?

QUESTION THREE

- (a) (i) Find the gradient of the curve $y = 2x^3 - 9x^2 + 12x + 3$ at the point (1,8).

- (ii) Find the coordinates of another point on the curve that has the same gradient as in part (i).

- (b) The number of followers of a new social media account can be modelled by:

$$F = 5t^3 - 840t^2 + 42180t \quad (0 \leq t \leq 90)$$

Where t is days after the account is created, and F is the number of followers.

- (i) What is the rate of increase of followers on day 5?

- Whiriwhiria te uara o p e tika ai tēnei.

- (c) The curve $f(x) = x^3 - px^2 + 21x - 7$ has a tangent at $x = 4$ that also crosses the curve at $(0, -7)$.

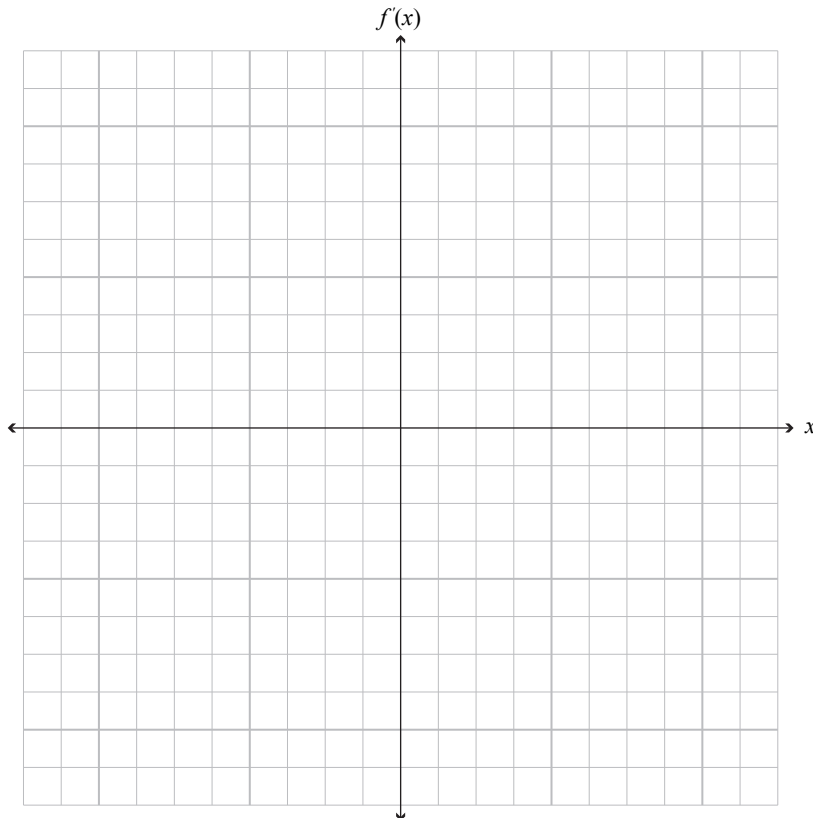
Find the value of p that makes this true.

HE HOAHOA WĀTEA

Ki te hiahia koe ki te tā anō i tō urupare ki te Tūmahi Tuarua (a), whakamahia te tukutuku kei raro nei. Me mārama tō tohu mai i te tuhinga e hiahia ana koe kia mākahia.

SPARE DIAGRAMS

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



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

QUESTION
NUMBER

**He whārangi anō ki te hiahiatia.
Tuhia te tau tūmahi mēnā e hāngai ana.**

[illegible]

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

QUESTION
NUMBER

English translation of the wording on the front cover

Level 2 Mathematics and Statistics 2023

91262M Apply calculus methods in solving problems

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.

Show ALL working.

Make sure that you have the Formulae Sheet L2–MATHMF.

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

Check that this booklet has pages 2–23 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (DO NOT WRITE). This area will be cut off when the booklet is marked.

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