

91262



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SUPERVISOR'S USE ONLY

# Level 2 Mathematics and Statistics, 2015

## 91262 Apply calculus methods in solving problems

2.00 p.m. Tuesday 10 November 2015  
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 Resource Sheet L2-MATHF.

Show ALL working.

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

ASSESSOR'S USE ONLY





**QUESTION TWO**

- (a) The gradient of function  $f$  is given by  $f'(x) = 4x - 3$   
The point  $(4,6)$  lies on the graph of the function.

Find the equation of the function  $f$ .

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- (b) A function  $g$  is given by  $g(x) = x^2 - 3x + 18$ .

- (i) Find the equation of the tangent at the point on the graph of  $g$  where the gradient is 0.

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- (ii) In relation to the graph, fully describe the point where this tangent meets the function.

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- (c) A skateboard park has a mound that is  $h$  metres high at the point where the horizontal distance, from a fixed point P, is  $x$  metres.

The mound can be modelled by

$$h = -0.5x^2 + 3x - 1.5$$



- (i) What is the maximum height of the mound?

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- (ii) A ramp up the side of the mound is a tangent to the mound.

The ramp can be modelled by the function

$$h = 0.5x - c$$



Use calculus to find the vertical distance below the top of the mound where the ramp will meet the mound.

*Ignore the thickness of the ramp.*

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**QUESTION THREE**

- (a) The velocity  $v$  m s<sup>-1</sup> of an object  $t$  seconds after it passes a fixed point can be modelled by the function

$$v(t) = 4t^3 - t^2 + 2t$$

Find the equation for the acceleration of the object.

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- (b) Find the equation of the tangent to the curve  $f(x) = x^3 - 2x^2 + x$  at the point (2,2) on the curve.

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- (c) In an area surrounding a farming airstrip there is a height restriction for fireworks of 50 m. The height  $h$  metres above the ground reached by a firework  $t$  seconds after it is fired, can be modelled by the function

$$h = 20t - 5t^2$$

Will the firework break the 50 m limit?

*Use calculus methods to justify your answer.*

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If you need to redraw your graph from Question Three (d), draw it on the grid below. Make sure it is clear which answer you want marked.





