2

SUPERVISOR'S USE ONLY

91262



Level 2 Mathematics and Statistics, 2017 91262 Apply calculus methods in solving problems

2.00 p.m. Friday 24 November 2017 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 space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

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

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

QUESTION ONE

(a) A function f is given by $f(x) = x^5 + 3x^2 - 7x + 2$.

Find the gradient of the graph of the function at the point where x = 1.

(b) Find the equation of the tangent to the graph of the function

$$f(x) = 6 + 14x - 2x^3$$

at the point (2,18) on the graph.

(c)	The movement of an object is recorded from the time it passes a fixed point.

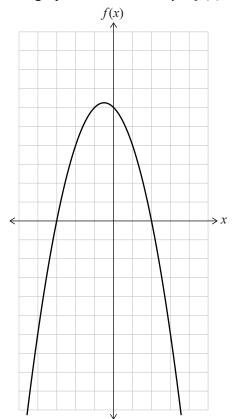
After t seconds it has a speed $v \text{ m s}^{-1}$, which can be modelled by the function

 $v(t) = 0.5t^2 - 2t + 1$

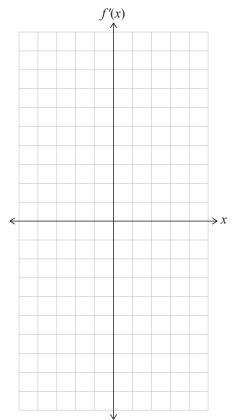
Use calculus to find how long it takes to reach an acceleration of 2.8 m $\ensuremath{\text{s}^{-2}}.$

and passes through th	e point $(5,a)$, where a is a	constant.		
Find the value of a .				
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The function $f(x) = x^2$	$a^2 + ax^2 + bx + 2$ has turning	ng points when $x = -1$ and	1 x = 3.	-
The function $f(x) = x^2$ Find the values of <i>a</i> a		ag points when $x = -1$ and	x = 3.	
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(a) The diagram below shows the graph of the function y = f(x)



Sketch the graph of the gradient function y = f'(x) on the axes below. Both sets of axes have the same scale.



If you need to redraw this graph, use the grid on page 11.

)	The graph of a function $f(x) = 2x^3 + bx^2 - 2$ has a turning point when $x = -1$.	ASSESS USE C
	Find the value of b .	
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		_
		_
	Use calculus to show that the line $y = 15x - 12$	
	is a tangent to the graph of the function $f(x) = 4x^2 - x + 4$.	
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	Use calculus to find the value of k if the line $y = 6x + k$ is a tangent to the graph of the	
	function $f(x) = x^2 + 2x - 1$.	
		_
		_
	There is made and a few and a	
	There is more space for your answer on the following page.	

	ASSES: USE C
Use calculus to prove that the graph of the function $y = x^3(3 - x)$ has a local maximum when $x = \frac{9}{4}$.	
Justify that the turning point is a local maximum.	

QUESTION THREE

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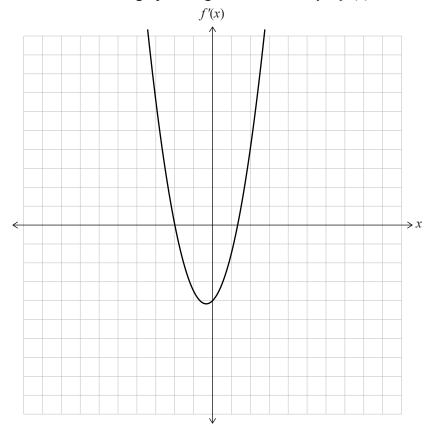
(a) The gradient graph of a function f(x) is given by

$$f'(x) = 6x^2 - 2x + 4$$

The point (1,3) lies on the graph.

Find the equation of the function $f(x)$.					

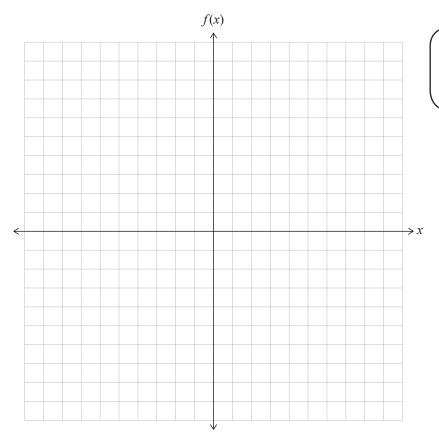




The point (0,0) is on the graph of the function y = f(x).

On the axes below sketch the function f(x).

Both sets of axes have the same scale.



If you need to redraw this graph, use the grid on page 11.

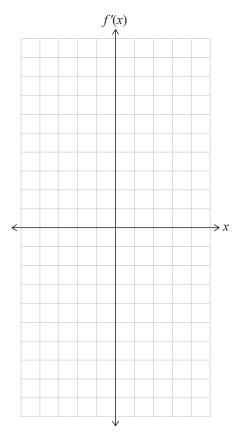
	Justify that this is the maximum distance.
i)	What is the maximum distance of the object from the point P?
i)	Using calculus, find the speed of the object 5 seconds after its motion began being recorded.
	has a velocity of 6 cm s ⁻¹ .
•	is moving away from P, and
•	is 12 cm from P
Vh	en a recording of the object's motion begins, the object:
A fi	xed point P is marked on the track.
	object can move in either direction on a straight track and has a constant acceleration -4 cm s^{-2} .

former squares and folding along the dotted line	↑ □		
ustify that this is the maximum volume.			
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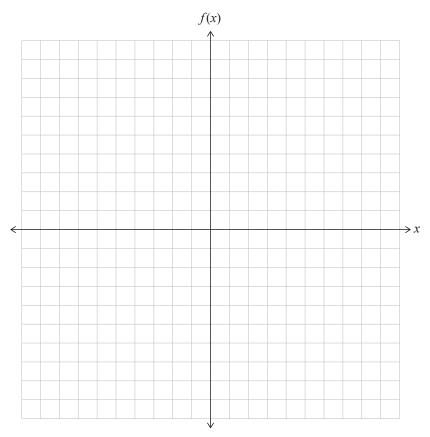
SPARE GRIDS

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



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



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