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NZQA

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MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 2 Mathematics, 2007

90286 Find and use straightforward derivatives and integrals

Credits: Four

2:00 pm Thursday 29 November 2007

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

Make sure you have a copy of Formulae Sheet L2-MATHF.

You should answer ALL the questions in this booklet.

Show ALL working. For every question you are required to show differentiation or integration. Calculator answers alone are not sufficient.

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 2–7 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.

For Assessor's use only	**Achievement Criteria**	
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Find and use straightforward derivatives and integrals. ☐	Apply calculus techniques to solve straightforward problems. ☐	Apply calculus techniques to solve problems. ☐
Overall Level of Performance ☐		

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You are advised to spend 30 minutes answering the questions in this booklet.

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Show ALL working. For every question you are required to show differentiation or integration. Calculator answers alone are not sufficient.

QUESTION ONE

The **gradient function** of a curve is $f'(x) = 3x^2 - 8x + 1$.

The curve passes through the point $(2, 6)$.

Find the equation of the curve.

QUESTION TWO

The point $P(-2, 4)$ lies on the curve $y = x^3 - 5x + 2$.

Find the gradient of the tangent to the curve at point P.

QUESTION THREE

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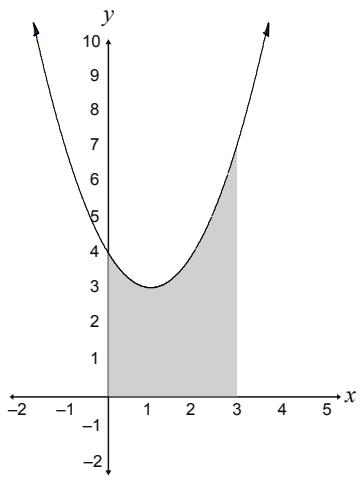
The curve has the equation $y = x^2 - 2x + 4$.

Calculate the shaded area.



QUESTION FOUR

A parabola has equation $y = \frac{1}{4}x(12 - x) = 3x - \frac{1}{4}x^2$.

Find the value of x where the slope of the curve is 3.5

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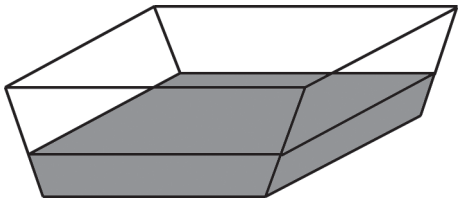
QUESTION FIVE



Water is being added to a trough.
The volume V litres of water in the trough is given by

$$V = 9h + 0.025h^2$$

where h is the depth of water in centimetres.

Find the rate of change of the volume, with respect to h, when the water has a depth of 15 cm.

QUESTION SIX

A motorcycle is traveling at a speed of 18 m/s when it passes police checkpoint P.

It begins to decelerate. Its acceleration a m/s^2 until it stops is given by

$$a = -2$$

How many seconds after passing P did the motorcycle take to stop?

QUESTION SEVEN

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The daily profit (in thousands of dollars) from sales of a chemical is given by

$P(x) = x^3 - 12x^2 + 36x + 3$, for $1 \leq x \leq 8$

where x is the number of tonnes of chemical sold daily.

What is the minimum daily profit?

Note that Question Eight follows on the next page.

QUESTION EIGHT

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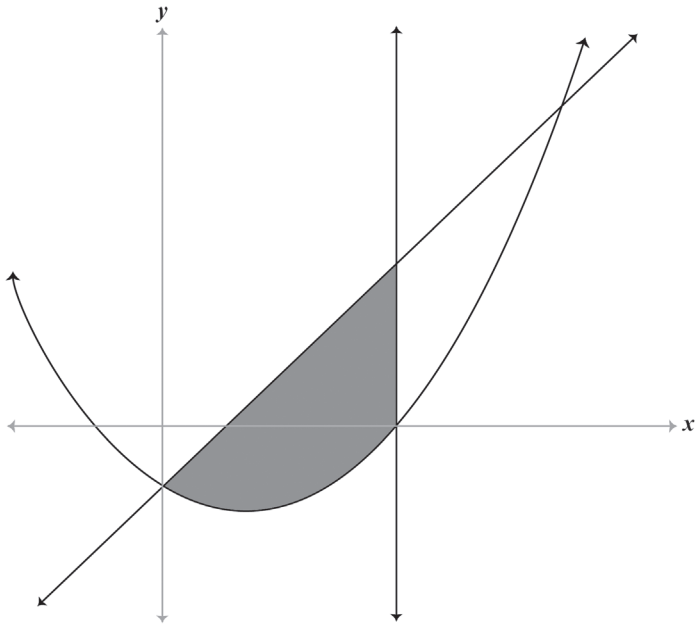
The area bounded by the curve $y = 2x^2 - 3x - 2$ and the lines $y = kx - 2$ and $x = 2$ is shown by the shaded area.

If the shaded area is equal to 8 then find the value of k.



Extra paper for continuation of answers if required.
Clearly number the question.

Assessor's use only

Question number

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