90286

Level 2 Mathematics, 2006

90286 Find and use straightforward derivatives and integrals

Credits: Four

2.00 pm Wednesday 29 November 2006

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.

Give any derivatives or integrals that are used when answering the questions.

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 2–8 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		

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

QUESTION ONE

Find the **gradient** of the curve $y = 3x^2 - 5x + 4$ at the point where $x = 2$.

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QUESTION TWO

The **gradient function** of a curve is $f'(x) = 8x^3 - 5$.

The curve passes through the point (1,4).

Find the **equation** of the curve.

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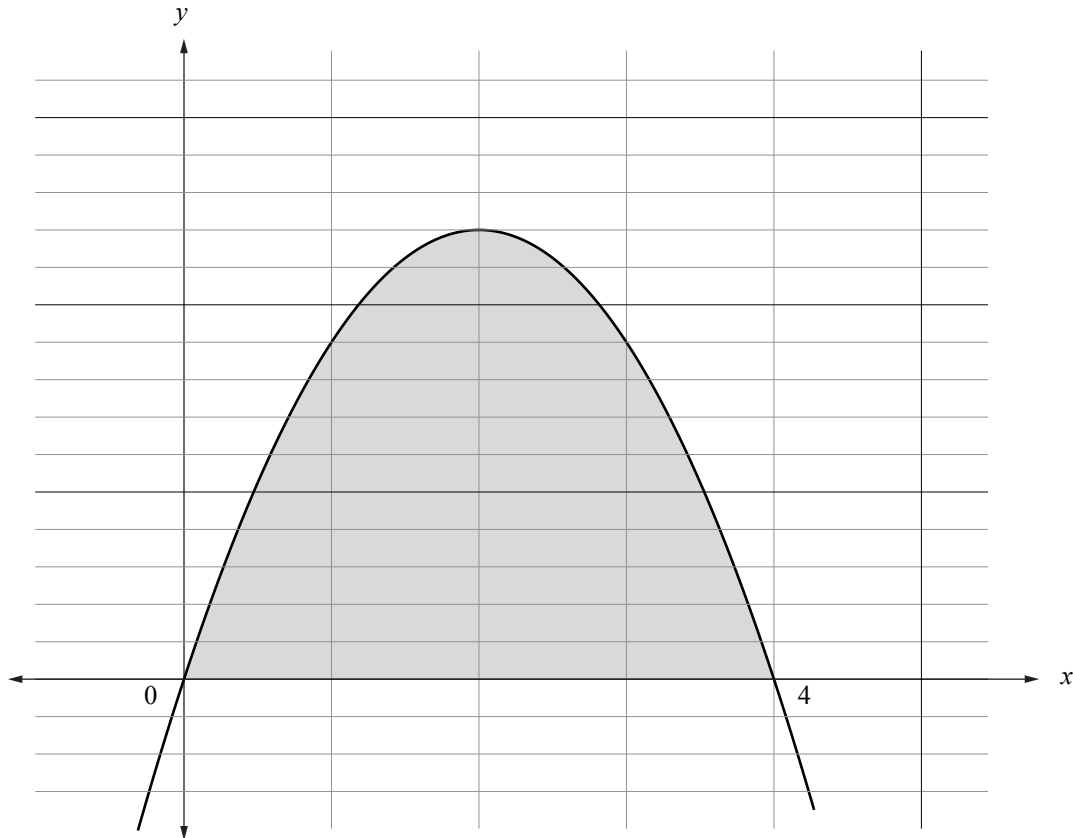
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QUESTION THREE

The curve shown in the graph has the equation $y = 12x - 3x^2$.

Calculate the **shaded area**.

QUESTION FOUR

The gradient of the curve $y = x^2 - 6x + 7$ at the point P is -4.

Find **the coordinates** (x, y) of point P.

QUESTION FIVE

A weather balloon is released from the ground.

The rate at which it gains height is given by

$v = 2 - 0.1\, t$

where v is the rate of change of height in kilometres per hour
and t is the time after release in hours.

What **height** will the balloon have reached after 3 hours?

QUESTION SIX

A bend on a racing circuit can be described by the curve $y = -x^2 + 4x + 5$ relative to a set of axes on a racing track.

A driver loses control of the car at the point (5,0) on the track, and the car continues straight ahead (ie along the tangent to the curve at that point).

Find the **equation of the path** that the car follows after the driver loses control.

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QUESTION SEVEN

A curve has the equation $\quad y = x\,(x - 2)(x - 6)$

$$= x^3 - 8x^2 + 12x$$

Find the total area enclosed by the curve and x-axis between $x = 0$ and $x = 6$.

QUESTION EIGHT

A courier firm has a restriction on the size of parcels that it will carry at the normal rate.

The sum of the length, width and height of any parcel must be less than 162 cm.

The length of a box parcel is twice its width.

Find the maximum possible volume of the parcel that can be carried at the normal rate.

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

Question
number