Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Differentiation

Time allowed: 1 hour 40 minutes

Subject code **0580**

Mathematics

Questions from Paper 2 and Paper 4

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.
You may use a calculator.

Total marks

/ 80

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.
- Unless a question says otherwise, give answers that are not exact to 3 significant figures, and angles in degrees to 1 decimal place.

Information

- This paper has 10 questions worth 80 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 $y = ax^{11} + 3x^b$

$$\frac{dy}{dx} = 44x^{10} + 18x^c$$

Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ .....

[2]

Differentiation Click for more variations

2 **(a)** Differentiate $6 + 4x - x^2$.

..... [2]

(b) Find the coordinates of the turning point of the graph of $y = 6 + 4x - x^2$.

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(..... , ...) [2]

(a) Differentiation (b) Differentiation Click for more variations

3 **(a)** Differentiate $x^3 - 3x^2 + 1$.

..... [2]

(b) Find the coordinates of the turning points of the graph of $y = x^3 - 3x^2 + 1$.

(..... , ...)

(..... , ...)

[4]

(a) Differentiation (b) Differentiation Click for more variations

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4 **(a)** The point $(-1, 6)$ lies on a curve.

This curve has the derived function $\frac{dy}{dx} = -4x^3 - 9x^2 + 5$.

Show that $(-1, 6)$ is a stationary point of the curve.

[2]

(b) A different curve has equation $y = 2x^3 - 6x + 8$.

(i) Calculate the gradient of the tangent to this curve at the point $(-2, 2)$.

..... [3]

(ii) Find the x-coordinates of the stationary points of this curve.

$x =$ ..... and $x =$ ..... [2]

(a) Differentiation (b)(i) Differentiation (b)(ii) Differentiation Click for more variations

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5 **(a)** Find the coordinates of the turning points of the graph of $y = x^3 - 12x + 6$.
You must show all your working.

(..... , ...) and (..... , ...) [5]

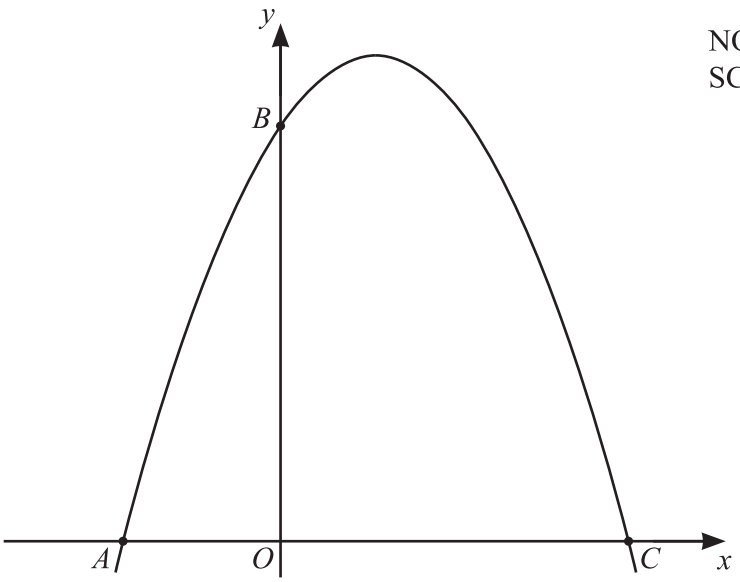
(b) Determine whether each turning point is a maximum or a minimum.
Show how you decide.

[3]

(a) Differentiation (b) Differentiation Click for more variations

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6



NOT TO SCALE

The diagram shows a sketch of $y = 18 + 5x - 2x^2$.

(a) Find the coordinates of the points A, B and C.

A (..... , ...)

B (..... , ...)

C (..... , ...) [4]

(b) Differentiate $18 + 5x - 2x^2$.

..... [2]

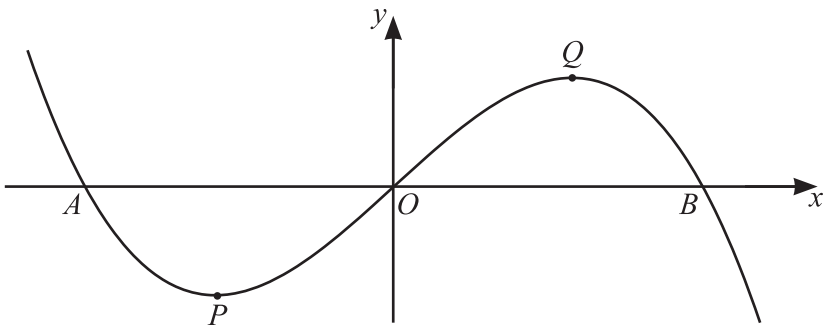
(c) Find the coordinates of the point on $y = 18 + 5x - 2x^2$ where the gradient is 17.

(..... , ...) [3]

(a) Solving quadratics by factorising (b) Differentiation (c) Differentiation Click for more variations

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7



NOT TO SCALE

The diagram shows the graph of $y = 3x - x^3$.
The graph crosses the x-axis at A, at O and at B.
The turning points of the graph are at P and at Q.

(a) Find the x-coordinate of A and the x-coordinate of B.
Give your answers as exact values.

x-coordinate of A .....

x-coordinate of B .....
[3]

(b) **(i)** Differentiate $3x - x^3$.

..... [2]

(ii) Find the coordinates of P and Q.

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P (..... , ...)

Q (..... , ...)
[4]

(a) Solving quadratics by factorising (b)(i) Differentiation (b)(ii) Differentiation Click for more variations

8 **(a)** $y = x^4 - 4x^3$

(i) Find the value of y when $x = -1$.

$y =$ ..... [2]

(ii) Find the two stationary points on the graph of $y = x^4 - 4x^3$.

(..... , ...)

(..... , ...) [6]

(b) $y = x^p + 2x^q$

$\frac{dy}{dx} = 11x^{10} + 10x^4$, where $\frac{dy}{dx}$ is the derived function.

Find the value of p and the value of q.

$p =$ .....

$q =$ ..... [2]

(a)(i) Substitution (a)(ii) Differentiation (b) Differentiation Click for more variations

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9 $y = x^7 - 7x^6$

(a) Find the derivative of y with respect to x.

..... [2]

(b) Find the equation of the tangent to the graph of $y = x^7 - 7x^6$ at the point where $x = -1$.
Give your answer in the form $y = mx + c$.

$y =$ ..... [4]

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(c) The graph of $y = x^7 - 7x^6$ has two turning points.

Find the coordinates of these points.
You must show all your working.

(..... , ...)

(..... , ...) [5]

(a) Differentiation (b) Differentiation (c) Differentiation Click for more variations

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10 $f(x) = x(x-1)(x-2)$

(a) Find the coordinates of the points where the graph of $y = f(x)$ crosses the x-axis.

(..... , ...)

(..... , ...)

(..... , ...) [2]

(b) Show that $f(x) = x^3 - 3x^2 + 2x$.

[2]

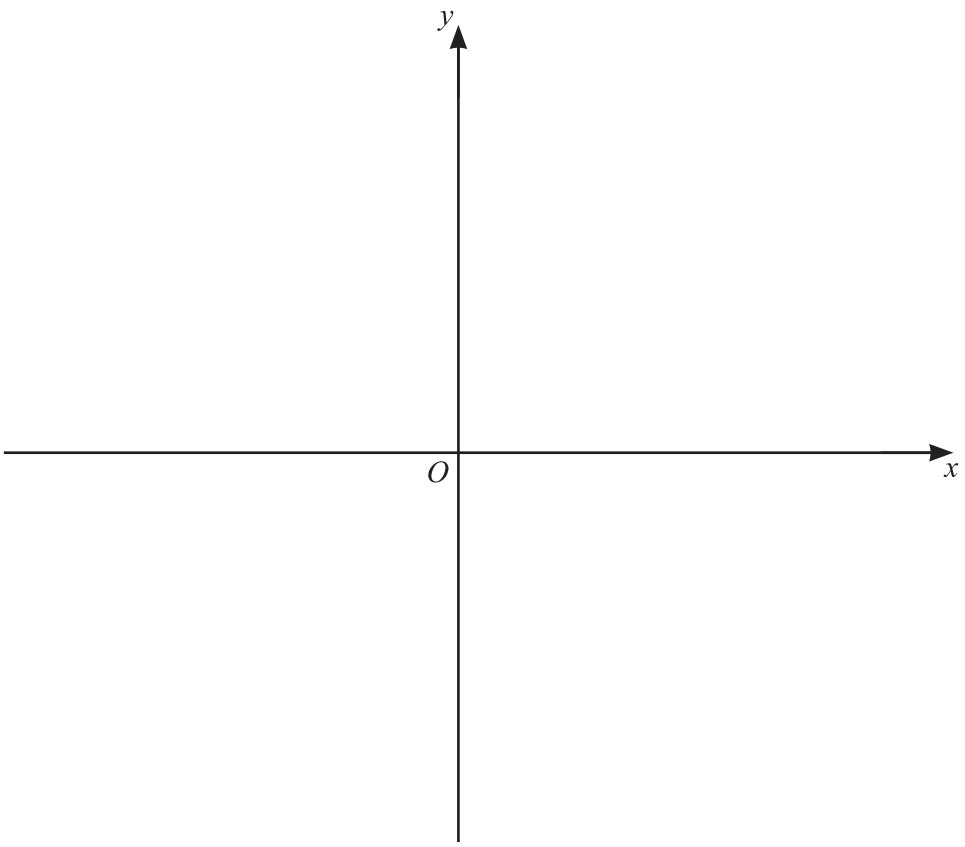
(c) Find the coordinates of the turning points of the graph of $y = f(x)$.
Show all your working and give your answers correct to 1 decimal place.

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(..... , ...)

(..... , ...) [8]

(d) Sketch the graph of $y = \mathrm{f}(x)$.



[2]

(a) Plotting curves and graphical solutions (b) Expanding triple brackets (c) Differentiation (d) Differentiation

Click for more variations

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