14 (a) \( y = 2x^3 + 3x^2 + 2 \)

Find \( \frac{dy}{dx} \)

(b) The point \( P \) lies on the curve with equation \( y = 2x^3 + 3x^2 + 2 \).

The gradient of the curve at \( P \) is \( \frac{3}{2} \).

Find the coordinates of \( P \).

June 2015, 4H Paper, Q21

21 \( y = x^3 + 6x^2 + 5 \)

(a) Find \( \frac{dy}{dx} \)

The curve with equation \( y = x^3 + 6x^2 + 5 \) has two turning points.

(b) Work out the coordinates of these two turning points.
Show your working clearly.
18 \( y = x^3 - 4x^2 + 4x + 3 \)

(a) Find \( \frac{dy}{dx} \)

The diagram shows a sketch of the curve with equation \( y = x^3 - 4x^2 + 4x + 3 \)
The point \( P \) is a turning point on the curve.

(b) Work out the coordinates of \( P \).
    Show clear algebraic working.
June 2015 4HR Paper

21 \( y = x^2 - \frac{16}{x} \)

(a) Find \( \frac{dy}{dx} \)

The graph shows part of the curve with equation \( y = x^2 - \frac{16}{x} \)

The point \( P \) is the turning point of the curve.

(b) Work out the coordinates of \( P \).
16 The curve \( C \) has equation \( y = 3x^2 - 12x + 8 \)

(a) Find \( \frac{dy}{dx} \)

\[
\frac{dy}{dx} = \ldots \ldots
\]

(b) Find the coordinates of the point on \( C \) where the gradient of the curve is 18

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May 2016 3HR Paper Q15

15 \( y = x^3 - \frac{9}{2}x^2 - 54x + 10 \)

(a) Find \( \frac{dy}{dx} \)

The curve with equation \( y = x^3 - \frac{9}{2}x^2 - 54x + 10 \) has two turning points.

(b) Find the \( x \) coordinate of each of these two points.
16. A curve has equation \( y = x^3 + 3x^2 - 24x \)

(a) Find \( \frac{dy}{dx} \)

(b) Find the coordinates of the turning points of the curve.

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12. (a) Complete the table of values for \( y = x^3 - 12x + 2 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-7</td>
<td>18</td>
</tr>
</tbody>
</table>
(c) For the curve with equation $y = x^3 - 12x + 2$

(i) find $\frac{dy}{dx}$

(ii) find the gradient of the curve at the point where $x = 5$
17. A curve has equation \( y = x^2 + 3x \)

(a) Find \( \frac{dy}{dx} \)

(b) Find the gradient of the curve at the point where \( x = -4 \)

(c) The curve has a minimum point. Find the coordinates of this minimum point.

Nov 2008 4H Paper

20. (a) Differentiate with respect to \( x \)

(i) \( 3x^2 - x \)

(ii) \( \frac{1}{x} \)

(b) Find the coordinates of the points on the curve \( y = x^3 \) where the gradient is 12
20. A curve has equation \( y = x^3 - 5x^2 + 8x - 7 \)

(a) Find the gradient of the curve at \((2, -3)\).

(b) What does your answer to part (a) tell you about the point \((2, -3)\)?
16. Part of the graph of $y = x^2 - 2x - 4$ is shown on the grid.

(a) Write down the coordinates of the minimum point of the curve.

(b) Use the graph to find estimates of the solutions to the equation $x^2 - 2x - 4 = 0$
Give your answers correct to 1 decimal place.
(c) Draw a suitable straight line on the grid to find estimates of the solutions of the equation $x^2 - 3x - 6 = 0$

(d) For $y = x^2 - 2x - 4$

(i) find $\frac{dy}{dx}$,

(ii) find the gradient of the curve at the point where $x = 6$
Nov 2005 4H Paper

15. The diagram shows the graph of \( y = x^3 - 12x + 17 \)
   \( A \) is the maximum point on the curve.
   \( C \) is the minimum point on the curve.
   The curve crosses the \( y \) axis at \( B \).

For the equation \( y = x^3 - 12x + 17 \)

(a) find \( \frac{dy}{dx} \),

(b) find the gradient of the curve at \( B \),

(c) find the coordinates of \( A \) and \( C \).
17. A curve has equation \( y = x^2 - 4x + 1 \).

(a) For this curve find

(i) \( \frac{dy}{dx} \),

(ii) the coordinates of the turning point.

(b) State, with a reason, whether the turning point is a maximum or a minimum.

(c) Find the equation of the line of symmetry of the curve \( y = x^2 - 4x + 1 \)

May 2012 4H Paper

13 (a) Complete the table of values for \( y = x^3 - 3x - 1 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>(-2)</th>
<th>(-1)</th>
<th>(0)</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) On the grid, draw the graph of \( y = x^3 - 3x - 1 \) for \(-2 \leq x \leq 3\)
(c) By drawing a suitable straight line on the grid, find an estimate for the solution of the equation \( x^3 - 3x - 6 = 0 \)

Give your answer correct to 1 decimal place.

(d) For the curve with equation \( y = x^3 - 3x - 1 \)

(i) \( \frac{dy}{dx} \)

(ii) find the gradient of the curve at the point where \( x = 4 \)