



CAMBRIDGE
International Examinations

MATHEMATICS (EXTENDED) 0580
IGCSE MAY/JUNE 2020

REVISION 15
DERIVATIVES

NOTES:

1. Find the coordinates of the turning point of the curve $y = 10 + 27x - 4x^2$ and determine the nature of the turning point.

[4]

2. Find the coordinates of the turning point of the curve $y = 2 + x + (1 + x)^2$ and determine the nature of this turning point.

[5]

3. Find the coordinates of the turning point on the curve $y = x + \frac{1}{2}x^2 + \frac{1}{3}x^3 + \frac{1}{4}x^4$.

Determine the nature of the turning point.

[5]

4. Given that $(1, 8)$ is the stationary point of the curve $y = x^3 - 9x^2 + px + q$, find the values of p and q .

Hence find the coordinates of the other stationary point(s) of the curve. [5]

5. Find the coordinates of the turning points of the curve $y = 2x^3 - 3x^2 - 12x + 5$ and determine the nature of the turning points. [6]

6. Find the coordinates of the turning points of the curves $y = 4x^2 + 3x + 4$ and $y = x^2 + x + 1$.
Determine the nature of their turning points.

[6]

7. The equation of a curve is $y = 2 - x + x^3$. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.

Hence, or otherwise, find the coordinates of the turning points of the curve and determine the nature of these turning points.

[7]

8. The equation of a curve is $y = x^2 - 4x + 9$.
- (a) Find the range of values of x for which y is a decreasing function.
 - (b) Find the coordinates of the turning points of the curve and determine the nature of these turning points. [8]

9. A closed right cylindrical can of base radius r cm and height h cm is to be constructed with thin materials of area 600π cm².

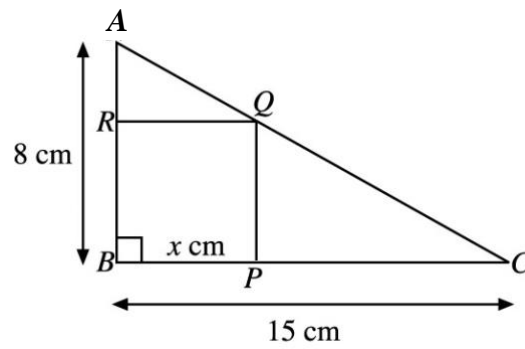
Determine the value of r and h in order to construct a can with greatest possible volume. [6]

10. Given that $(2, -34)$ and $(-3, 91)$ are the turning points of the curve $y = 2x^3 + px^2 + qx + r$.
Find the values of p , q and r and hence determine the nature of the turning points. [7]

11. A piece of wire 100 cm is cut into two portions. One portion is bent to form a square of side x cm and other is bent to form a circle of radius r cm. Find the value of x if the total area of the square and the circle is to be a minimum. (Leave your answer in terms of π). [6]

12. Find the coordinates of the stationary point of the curve $y = 27x + 4x^2 + 2$ and determine the nature of the stationary point. [5]

13. In $\triangle ABC$, $AB = 8$ cm, $BC = 15$ cm and $\hat{A}BC = 90^\circ$. $BPQR$ is a rectangle inscribed in $\triangle ABC$. Given that $BP = x$ cm, express the area of $BPQR$ in terms of x and hence find the maximum possible area of the rectangle. [6]



14(a) The curve $y = 2x^3 + 3x^2 + kx - 4$ has a minimum point at $x = 1$. Find

(i) the value of k ,

(ii) the coordinates of the maximum point.

[4]