

LEARN ABOUT
OUR ONLINE
COURSES HEREFREE
MINI-COURSEREGISTER FOR
FREE MINI COURSEVIDEO SOLUTIONS
FOR THIS
WORKSHEET

TECHNIQUES AND APPLICATIONS OF DIFFERENTIATION

QUESTION 1

Find the derivative of each of the following,

(a) $y = (7x^3 + x)^4$

(b) $f(x) = \frac{1}{\sqrt{3x^2 - 1}}$

(c) $y = \frac{2}{(3 - \sqrt{x})^3}$

QUESTION 2Differentiate $\sqrt{x}(x^2 + 2)^5$ with respect to x .**QUESTION 3**Find the derivative of $y = \frac{x+1}{\sqrt{3x^2-1}}$.**QUESTION 4**Find the gradient of the curve $y = (x-1)(2x+3)$ at $x = 2$.**QUESTION 5**The curve $y = ax^2 + bx$ has a gradient of 2 at the point $(2, 0)$. Find the values of a and b .**QUESTION 6**Find the equation of the tangent and the normal to the curve $y = x^3 + x^2 - 4x - 3$ at the point where $x = -2$.**QUESTION 7**Find the equation of the normal to the curve $y = 3x^2 + 5x - 9$ at the point where $x = -2$, hence find the y -coordinate of the point where this normal meets the curve again.**QUESTION 8**Find the coordinates of point P on the curve $y = 3x^2 - 2x + 1$ for which the normal at P is parallel to the line $y = 2x - 3$.**QUESTION 9**The radius, r cm, of a hemisphere is increasing at a constant rate of 0.5 cm/s. Find the rate of increase of the volume of the hemisphere when $r = 3$.

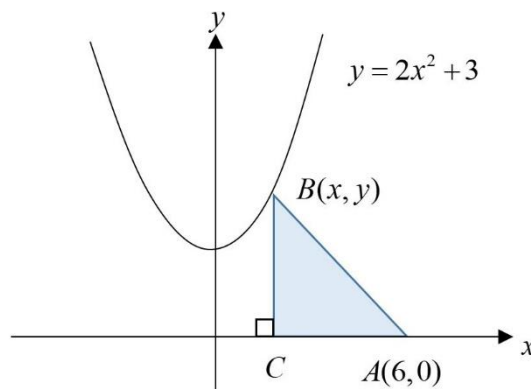
QUESTION 10

The values of x and y are related by the equation $xy = 23x - 8$. If x increases at the rate of 0.03 unit/s, find the rate of change of y when $y = 21$.

QUESTION 11

The figure shows part of the curve $y = 2x^2 + 3$. The point $B(x, y)$ is a variable point that moves along the curve for $0 < x < 6$. C is a point on the x -axis such that BC is parallel to the y -axis and $A(6, 0)$ lies on the x -axis.

Express the area of triangle ABC , T units², in terms of x , and find an expression for $\frac{dT}{dx}$. Given that when $x = 2$, T is increasing at the rate of 0.8 units²/s, find the corresponding rate of change of x at this instant.



QUESTION 12

The equation of a curve is $y = x^3 + 4x^2 + kx + 3$, where k is a constant. Find the set of values of k for which the curve is always an increasing function.

QUESTION 13

Find the coordinates of the stationary points on the curve $y = x^3 - 3x + 2$. Determine its nature by using the first derivative test. Hence, sketch the curve.

QUESTION 14

Find the coordinates of the stationary point on the curve $y = 2x^3 + 3x^2 - 120x + 4$. Determine its nature by using the second derivative test. Hence, sketch the curve.