



# Questions

The Equation of a Tangent to a Curve

Increasing & Decreasing Functions

Determining Local Extrema of a Function

## The Equation of a Tangent to a Curve

Q1) Find the gradient of the tangent line to the curve at the indicated point.

a)  $f(x) = 2x^2 + x - 3$  at  $x = 2$

c)  $f(x) = x^2 + 4x - 4$  at  $x = \frac{1}{2}$

b)  $f(x) = -3x^2 + 7$  at  $x = -2$

d)  $f(x) = x^3 + 5x - 6$ ,  $x = -1$

Q2) Find the equation of the tangent line to the curve at the indicated point.

a)  $y = x^2 + 3x + 6$  at  $(1, 10)$

c)  $y = 4\sqrt{x}$  at  $(9, 12)$

b)  $y = x + \frac{1}{x}$  at  $(2, \frac{5}{2})$

d)  $y = \cos x$  at  $(\frac{\pi}{6}, \frac{\sqrt{3}}{2})$

## Increasing & Decreasing Functions

Q1) Is the given function increasing or decreasing at the indicated value?

a)  $f(x) = x^3 - 2x^2 + 6x + 3$  when  $x = 1$

b)  $f(x) = 2x^3 + x^2 - 8x - 1$  when  $x = -1$

c)  $f(x) = x^4 - 2x^3 - 2x^2 - 3$  when  $x = 2$

d)  $f(x) = 6x - x^4$  when  $x = -2$

Q2) The function  $f$  is given by  $f(x) = x^2 - \frac{3}{x}$ .

Is  $f(x)$  increasing or decreasing when  $x = -1$ ?



## Determining Local Extrema of a Function

Q1) Determine the  $x$  co-ordinate of the stationary point(s) of these functions.

a)  $f(x) = 2x^2 + 3$

c)  $h(x) = x^3 - 2x^2 + x - 5$

b)  $g(x) = \frac{1}{2}x^3 - x + 2$

d)  $f(x) = x^3 - 3x^2 - 24x + 10$

Q2) Find the co-ordinates of the stationary point(s) of the function.

a)  $f(x) = 2x^4 - 12$

c)  $y = x + \frac{1}{x}$

b)  $f(x) = 4x$

d)  $y = x - 3\sqrt{x}$

Q3) Find the stationary points of each of the following curves and determine their nature using a nature table.

a)  $y = \frac{1}{3}x^3 - 2x^2 + 3x - 1$

c)  $y = 2 + 5x - x^2 - x^3$

b)  $y = x^3 - 2x^2 - 4x + 1$

d)  $y = x^3(x - 2)$

Q4) Find the  $x$  co-ordinate of the stationary points of each of the following curves and determine their nature using the 2<sup>nd</sup> derivative.

a)  $y = 4x^2 + 6x$

c)  $y = x^4 - 12x^2$

b)  $y = x(x^2 - 4x - 3)$

d)  $y = x^{\frac{1}{2}}(x - 6)$

Q4) A curve has equation  $y = x^4 - 32x^2$ . Find the stationary points and determine what type of stationary point they are.

Q5) For each of the following functions, determine the greatest and least values on the indicated closed interval.

a)  $f(x) = x^3 - 2x^2 + x - 5, -2 \leq x \leq 1$



b)  $f(x) = x^3 - 3x^2 - 24x + 10, -1 \leq x \leq 6$

c)  $g(x) = 6x^2 + 3x + 2, -5 \leq x \leq 5$

d)  $f(x) = x^3(x - 2), -1 \leq x \leq 4$