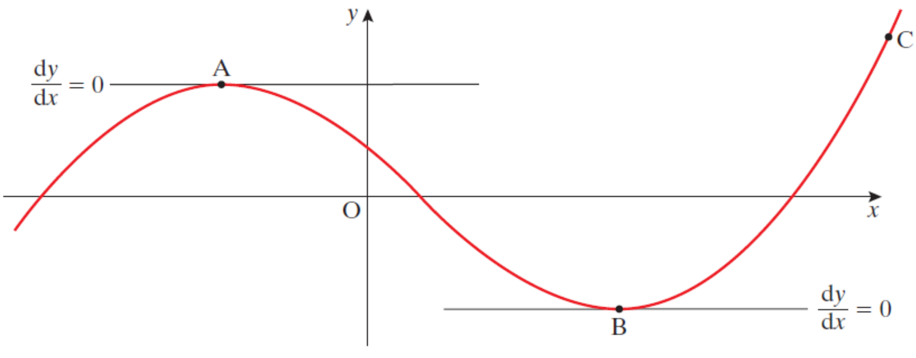
chapter 3

Applications of Differential Calculus

Section 3.2 Stationary points

PROJECT MATHS
Text & Tests 7

Points on a curve at which $\frac{dy}{dx}$ is zero are called **stationary points**.



In the curve above, A and B are stationary points and they are also **turning points**.

The turning point at A is called a **local maximum point**, since the value of the function at this point exceeds all values of the function immediately to the right or left of A.

A maximum value of a function is not necessarily the greatest value of the function.
This is illustrated in the curve above where the value of the function at C is greater than the value of the function at A.

The turning point at B above is called a **minimum turning point** or simply a **local minimum**.

Example 1

Find the turning points of the curve $y = x + \frac{1}{x}$.

Key Idea:

At turning points $\frac{dy}{dx} = 0$

Plan

1. differentiate curve to get slope function
2. let $\frac{dy}{dx} = 0$ and solve to get x values
3. Sub x values into curve to get y values

$y = x + \frac{1}{x} = x + x^{-1}$

1. $\frac{dy}{dx} = 1 - x^{-2}$

2. $1 - x^{-2} = 0$

($\times$ LCD $= x^2$) $x^2 - 1 = 0$

(DOTS) $(x-1)(x+1) = 0$

$\Rightarrow x = 1, \quad x = -1$

3. $x = 1, \quad y = 1 + \frac{1}{1} = 2$

$x = -1, \quad y = -1 - \frac{1}{1} = -2$

Points $(1, 2)$ and $(-1, -2)$