Increasing and Decreasing Functions

SUBJECT : MATHEMATICS
CHAPTER NUMBER:6
CHAPTER NAME : Application of Derivatives

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Increasing and Decreasing Function

In this topic, we shall study, A function $f(x)$ is said to be increasing or decreasing on [a,b] if

(i) The value of $f(x)$ increases with the increase in x.

OR

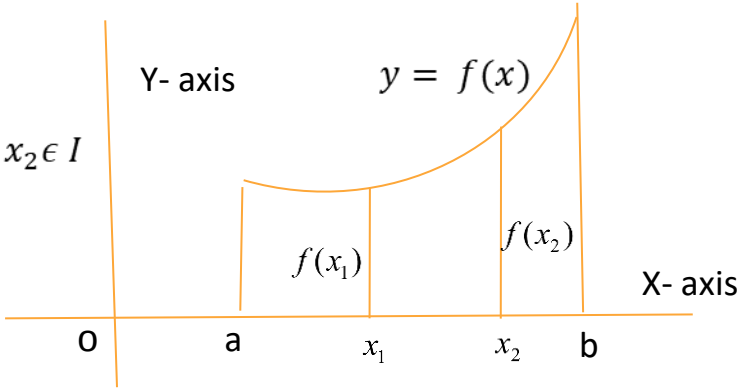
(ii) The value of $f(x)$ decreses with the decrease in x.

INCREASING FUNCTION:-

Let I be an open interval contained in the domain of real valued function f, Then f is said to be

(i) Increasing on I, if $x_1 < x_2$ then $f(x_1) \leq f(x_2)$ for $x_1, x_2 \epsilon I$

(ii) Strictly increasing on I if $x_1 < x_2$ then $f(x_1) < f(x_2)$ for $x_1, x_2 \epsilon I$

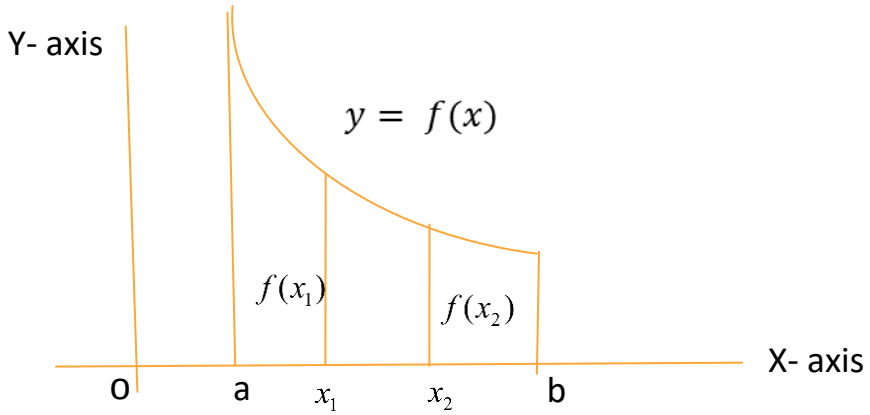


DECREASING FUNCTION:-

Let I be an open interval contained in the domain of real valued function f, Then f is said to be

(i) Decreasing on I, if $x_1 < x_2$ then $f(x_1) \geq f(x_2)$ for $x_1, x_2 \epsilon I$

(ii) Strictly decreasing on I if $x_1 < x_2$ then $f(x_1) > f(x_2)$ for $x_1, x_2 \epsilon I$



Monotonic Function(Increasing or decreasing of a Function on an interval)

A function $f(x)$ is said to be monotonic on an interval (a,b) if it is either increasing and decresing on (a,b).

NECESSARY AND SUFFICIENT CONDITIONS FOR MONOTONICITY

Now , we see how to determine the function increasing and decreasing using derivative of a function.

NECESSARY CONDITION

Let $f(x)$ be contineous on [a,b] and differentiable on (a,b).

(i) If $f(x)$ is strictly increasing on (a,b) then $f'(x) > 0$ for all $x\epsilon(a,b)$

(ii) If $f(x)$ is strictly decreasing on (a,b) then $f'(x) < 0$ for all $x\epsilon(a,b)$

SUFFICIENT CONDITION

Let $f(x)$ be a differentable function defined on an open interval (a,b)

(i) If $f'(x) > 0$ for all $x\epsilon(a,b)$ then f(x) is increasing on (a,b).

(ii) If $f'(x) < 0$ for all $x\epsilon(a,b)$ then f(x) is decreasing on (a,b).

Working rule for finding out the interval for increasing and decreasing function.

Step-1

Find out $\frac{dy}{dx}$ of the given function.

Step-2

If $\frac{dy}{dx} > 0$ then, function is increasing function.

If $\frac{dy}{dx} < 0$ then, function is decreasing function.

Problem- 1

Find the intervals in which the Function $y = 2x^3 - 3x$ is increasing or decreasing.

Problem- 2

Find the intervals in which the Function $y = -2x^3 - 9x^2 - 12x + 1$ is increasing or decreasing.

HOME ASSIGNMENT

Q1. Determine the value of x for which $f(x) = \frac{x-2}{x+1}, x \neq -1$ is increasing or decreasing.

Q2. Determine the interval in which the function $f(x) = x^4 - 8x^3 + 22x^2 - 24x + 21$ is decreasing or increasing.

Q3. Find the intervals where $f(x) = (x-1)^3(x-2)^2$ is increasing or decreasing.

THANKING YOU

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