

INTERNATIONAL INDIAN SCHOOL BURAI DAH

Worksheet for the Academic Year 2023-24

CLASS: 12

SUBJECT: Mathematics

DATE: 9/ 08/23

LESSON : Application of Derivatives

LEVEL – 1

1. The radius of a cylinder is increasing at the rate of 3m/s and its height is decreasing at the rate of 4m/s. The rate of change of volume when radius is 4m and height is 6m is

[a) $80\pi \text{ cu. m/s}$ b) $144\pi \text{ cu m/s}$ c) 80 cu m/s d) 64 cu m/s]

2. The function $f(x) = x^2 - 2x$ is strictly increasing in

[a) $(\infty, 1)$ b) $(1, \infty)$ c) R d) *None of these*]

3. If x is real, the minimum value of $x^2 - 8x + 17$

[a) -1 b) 0 c) 1 d) 2]

4. Let M and m be the absolute minimum and absolute maximum value of $f(x) = 2x^3 - 9x^2 + 12x + 5$ in $[0, 3]$, then $M - m$ is

[a) 5 b) 1 c) 4 d) 9]

LEVEL – 2

1. The function which is neither increasing nor decreasing in $(\frac{\pi}{2}, \frac{3\pi}{2})$ is

[a) $\operatorname{cosec} x$ b) $\tan x$ c) x^2 d) $|x-1|$]

2. The smallest value of the polynomial $x^3 - 18x^2 + 96x$ in $[0, 9]$ is

[a) 126 b) 0 c) 135 d) 160]

3. The maximum volume of the right circular cone having slant height 3m is

[a) $2\sqrt{3}$ b) $3\sqrt{3}$ c) 6π d) $\frac{4}{3}\pi$]

4. Find the intervals in which the following functions (i) strictly increasing (ii) strictly decreasing : a) $f(x) = 3x^4 - 4x^3 - 12x^2 + 5$ b) $f(x) = \frac{3}{10}x^4 - \frac{4}{5}x^3 - 3x^2 + \frac{36}{5}x + 11$

c) $f(x) = \frac{3}{2}x^4 - 4x^3 - 45x^2 + 51$

LEVEL – 3

1. The function $f(x) = \cot^{-1} x + x$ increases in the interval

[a) $(1, \infty)$ b) $(-1, \infty)$ c) $(0, \infty)$ d) $(-\infty, \infty)$]

2. The maximum value of $\sin x \cdot \cos x$ is

[a) $\frac{1}{4}$ b) $\frac{1}{2}$ c) $\sqrt{2}$ d) $2\sqrt{2}$]

3. Find the coordinates of a point of the parabola $y = x^2 + 7x + 2$ which is closest to the straight line $y = 3x - 3$.

4. Show that $f(x) = 5^x$ is increasing for all x .

LEVEL – 4

1. For what value of a , $f(x) = -x^3 + 4ax^2 + 2x - 5$ is decreasing for all x

[a) ± 5 b) 3 c) 0 d) *None of these*]

2. At $x = \frac{5\pi}{6}$, $f(x) = 2 \sin 3x + 3 \cos 3x$ is

[a) maximum b) minimum c) zero d) neither maximum nor minimum]

3. Let $(x) = x^2 + \frac{1}{x^2}$ and $g(x) = x - \frac{1}{x}$. If $h(x) = \frac{f(x)}{g(x)}$, then find the local minimum value of $h(x)$.

4. Of all closed circular cylindrical cans of volume $128\pi \text{ cm}^3$, find the dimensions of the can which has maximum surface area.