APPLICATION OF DERIVATIVES

EXPECTED LEARNING OUTCOMES:

After studying this chapter, the student will be able to

- Understand the concept of rate of change of quantities
- Identify increasing , decreasing, strictly increasing, strictly decreasing functions.
- Find the maximum and minimum value of the function by using first and second derivative test.
- Find the absolute maxima and the absolute minima.

CORE CONCEPTS AND MAJOR AREAS

The students apply their knowledge to estimate the maximum/minimum value of a function and also rate of change of quantities.

MCQ

1. The volume of a cube is increasing at the rate of 9cm^3/sec. The rate at which the surface area is increasing when the length of an edge is 9 cm is
   a) 3.6 cm^2/s   b) 4 cm^2/s   c) 9 cm^2/s   d) 10 cm^2/s
   Answer: b

ASSERTION – REASON BASED QUESTIONS

1. <u>ASSERTION:</u> The function $f(x) = \tan x – 4x$, $x \in (0, \frac{\pi}{2})$ is strictly increasing in the interval $\frac{\pi}{4} < x < \frac{\pi}{2}$
   <u>REASON:</u> A function f(x) is said to be an increasing function in [a,b], if, as x increases, f(x) also increases.
   Answer: Assertion statement is false, reason is true.

2. <u>ASSERTION</u> : The critical point for $f(x) = ax + by$ where $xy = c^2$ is $-c\sqrt{\frac{b}{a}}$.
   <u>REASON :</u> The critical point say 'c' in the domain of a function f(x) at which either f'(x) vanishes ie, f'(c) = 0 or f is not differentiable.
   Answer: Assertion statement and Reasoning statement are correct and Reasoning statement is the correct explanation of Assertion.

3. <u>ASSERTION :</u> If $\frac{d^2y}{dx^2} = 3 > 0$, then the function y has a maxima at the critical point.
   <u>REASON:</u> x = c is a point of maxima if f''(c)>0
   Answer: Assertion and Reasoning statements are false.

CASE BASED QUESTION

A steel company made a vessal where the shape of the pot is based on $f(x) = |x - 3| + |x - 2|$, where $f(x)$ represents the height of the pot.

1. When $x > 4$, what will be the height in terms of x?

   Answer: 2x-5

2. Will the slope vary with x value?

   Answer: yes.