Saitechinfo NEET JEE Academy, Kolathur, CH-99

Centum Cyclic Unit Test STDXII
Application of Derivatives, **TN State Board**
Max. Marks: 45 | Time: 90 Minutes

Part A: Answer the following questions (1 Mark Each)

1. Define the derivative of a function.
2. What is the physical interpretation of a derivative in the context of motion?
3. Find the derivative of $f(x) = x^2$.
4. If $y = 5x^3$, calculate $\frac{dy}{dx}$.
5. Explain what it means for a function to have a maximum at a point.
6. Differentiate $y = 7x + 3$.
7. What does the second derivative of a function represent?
8. Determine the derivative of $\sin(x)$.
9. If $f(x) = e^x$, what is $f'(x)$?
10. What is the derivative of a constant?

Part B: Answer the following questions (3 Marks Each)

11. Using differentiation, find the rate of change of the area of a circle with respect to its radius.
12. Determine the slope of the tangent to the curve $y = 3x^2 - 4x + 5$ at $x = 2$.
13. If $y = x^3 - 3x$, find $\frac{dy}{dx}$ and evaluate it at $x = 1$.
14. Explain the concept of marginal cost in economics and how derivatives are applied to calculate it.
15. For the function $f(x) = \ln(x)$, find $f'(x)$ and interpret its meaning.

Part C: Answer the following questions (5 Marks Each)

16. A particle moves along a line such that its position at any time t is given by $s(t) = 4t^3 - t^2 + 2t$. Find the velocity and acceleration at $t = 1$.
17. For the function $f(x) = x^3 - 3x + 2$, find all critical points and determine whether each is a maximum, minimum, or neither.
18. A manufacturer finds that the cost $C(x)$ in rupees of producing x units of a product is given by $C(x) = 5x^2 + 3x + 20$. Find the marginal cost when $x = 10$.

19. The profit $P(x)$ from selling x units of a product is given by $P(x) = -2x^2 + 12x - 20$. Determine the number of units that should be sold to maximize profit.

End of Question Paper
