

Chapter 5 Class 12 - Continuity & Differentiability - Mix Questions Worksheet 2 by teachoo

Chapter: [Chapter 5 Class 12 - Continuity & Differentiability](#)

Name: _____

School: _____

Roll Number: _____

3-Mark Questions

1. A ladder is leaning against a wall. The top of the ladder is sliding down the wall. Let y be the height of the top of the ladder and x be the distance of the bottom from the wall. Are x and y explicit or implicit functions of each other? Explain how you would find the rate at which x is changing with respect to y (i.e., dx/dy).
2. Consider the function $f(x) = x^{1/3}$. Is this function differentiable at $x = 0$? What does the tangent line look like at this point, and how does this relate to differentiability?

3. A car's distance from a starting point is given by $s(t) = t^3 - 6t^2 + 9t$. Find the points in time when the car's velocity is zero. What is the physical meaning of these points? Is the car's acceleration zero at these points?
4. Show that the function $g(x) = x - [x]$ is discontinuous at all integers. How could this function model the fractional part of a quantity that is measured or displayed, for example, on a digital scale that only shows integers?
5. Using the concept of composite functions, explain how to find the rate of change of the area of a circle with respect to time, if you know the rate at which its radius is changing.

5-Mark Questions

6. A bead is sliding on a wire shaped like the curve $y = \cos(x)$. The bead is at the point $\left(\frac{\pi}{2}, 0\right)$ and its x -coordinate is changing at a rate of 5 cm/s. Is the bead's y -coordinate increasing or decreasing at this instant? At what rate is it changing? Explain the relationship between the signs of the derivatives and the direction of movement.
7. A company's profit function is given by

$$P(x) = \begin{cases} 10x & \text{if } 0 \leq x \leq 100 \\ -0.1x^2 + 40x - 2000 & \text{if } x > 100 \end{cases}.$$
 - (a) Check if the profit function is continuous at $x = 100$.
 - (b) Check if the profit function is differentiable at $x = 100$.
 - (c) What do your answers to (a) and (b) signify for the company's profit model? Does the rate of change of profit change smoothly at the 100-unit mark?
8. Prove that every differentiable function must be continuous. Then, provide a graphical argument and a formal argument (using limits) to show that the converse is not true, using $f(x) = |x|$ as your example.
9. The voltage v in a circuit decays over time t according to the function $V(t) = V_0 e^{-t/RC}$, where R and c are constants (resistance and capacitance).
 - (a) Find the rate of change of voltage, dV/dt .
 - (b) Show that this rate is proportional to the voltage itself.

(c) Find the second derivative, d^2V/dt^2 . What does the sign of this derivative tell you about how the rate of decay is changing over time?

Important links

- Answer of this worksheet - <https://www.teachoo.com/25575/5353/Mix-Questions---Worksheet-2/category/Teachoo-Questions---Mix/>
- Full Chapter with Explanation, Activity, Worksheets and more – <https://www.teachoo.com/subjects/cbse-maths/class-12th/>
- Maths Class 12 - <https://www.teachoo.com/subjects/cbse-maths/class-12th/>

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