

Chapter 5 Class 12 - Continuity & Differentiability - Case Based Question Worksheet 2 by *teachoo*

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

Name: _____

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Case Study 1: The Expanding Puddle



After a rainstorm, a circular puddle is evaporating. Its radius r (in cm) at time t (in minutes) is given by $r(t) = \frac{60}{t+1}$.

1. Initial Radius: What is the radius of the puddle at the beginning ($t = 0$) ?
2. Rate of Radius Change: Find an expression for the rate at which the radius is changing, $r'(t)$. Is the radius increasing or decreasing?
3. Area and Chain Rule: The area of the puddle is $A = \pi r^2$. Use the chain rule to find an expression for the rate at which the area is changing with respect to time, dA/dt .
4. Rate of Area Change at 5 minutes: How fast is the area of the puddle changing after 5 minutes?

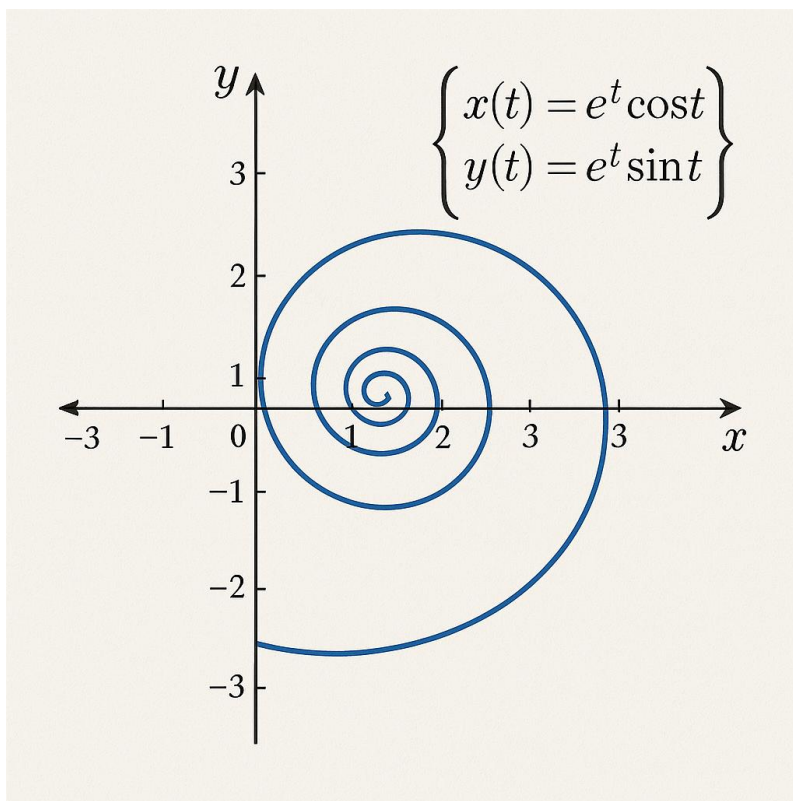
Case Study 2: Investment Growth



An investment's value V (in dollars) is modeled by $V(t) = (t + 1)^{(t+1)}$ for $t \geq 0$, where t is the number of years.

1. Logarithmic Approach: Explain why logarithmic differentiation is the most appropriate method to find the rate of growth of this investment.
2. Rate of Growth: Using logarithmic differentiation, find the derivative $V'(t)$.
3. Initial Growth Rate: What is the initial rate of growth at $t = 0$?
4. Relative Growth Rate: The relative growth rate is defined as $V'(t)/V(t)$. Find the relative growth rate for this investment. What do you notice about it?

Case Study 3: A Parametric Path



A particle moves in a plane such that its position at time t is given by the parametric equations:

$$\begin{aligned} x(t) &= e^t \cos(t) \\ y(t) &= e^t \sin(t) \end{aligned}$$

1. Velocity Components: Find the expressions for the horizontal velocity (dx/dt) and vertical velocity (dy/dt).
2. Slope of the Path: Find an expression for the slope of the path, dy/dx , in terms of t .
3. Horizontal Tangent: At what times t is the tangent to the path horizontal?
4. Speed: The speed of the particle is given by $\sqrt{(dx/dt)^2 + (dy/dt)^2}$. Find the speed of the particle at time t . How does the speed relate to the particle's distance from the origin?

Important links

- Answer of this worksheet - <https://www.teachoo.com/25579/5355/Case-Based-Questions---Worksheet-2/category/Teachoo-Questions---Case-Based/>
- 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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