

Chapter 6 Class 12 - Application of Derivatives - Case Based Question Worksheet 2 by *teachoo*

Chapter: [Chapter 6 Class 12 - Application of Derivatives](#)

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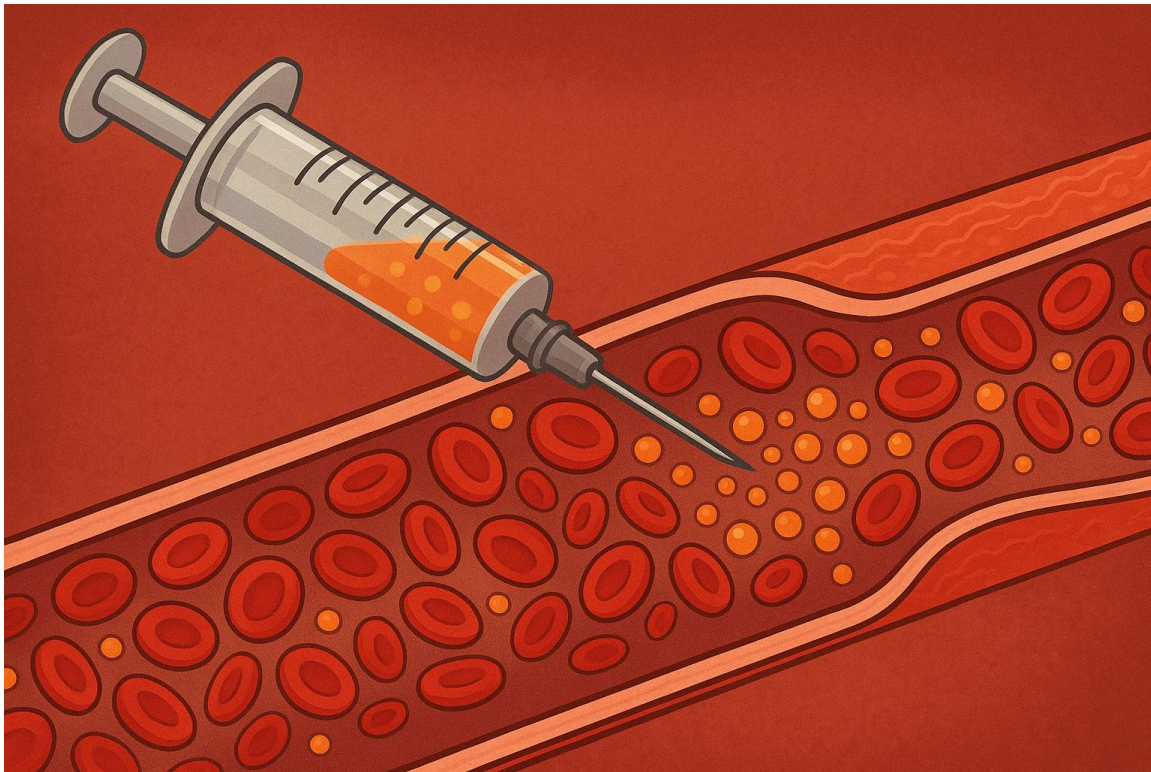
Case Study 1: Optimal Travel Time



A person is on an island 8 km from the nearest point on a straight shoreline. They want to reach a village located 10 km down the shore from that nearest point. The person can row a boat at a speed of 4 km/h and can walk at a speed of 5 km/h.

1. Modeling the Time: Let x be the distance from the point on the shore nearest the island to the point where the person lands the boat. Write a function $T(x)$ for the total travel time (time rowing + time walking).
2. Finding Critical Points: Find the derivative of the time function, $T'(x)$, and find the critical value of x .
3. Minimizing Time: Use the first derivative test to determine if this critical point corresponds to a minimum travel time.
4. Conclusion: Where should the person land the boat to reach the village in the least possible time? What is this minimum time?

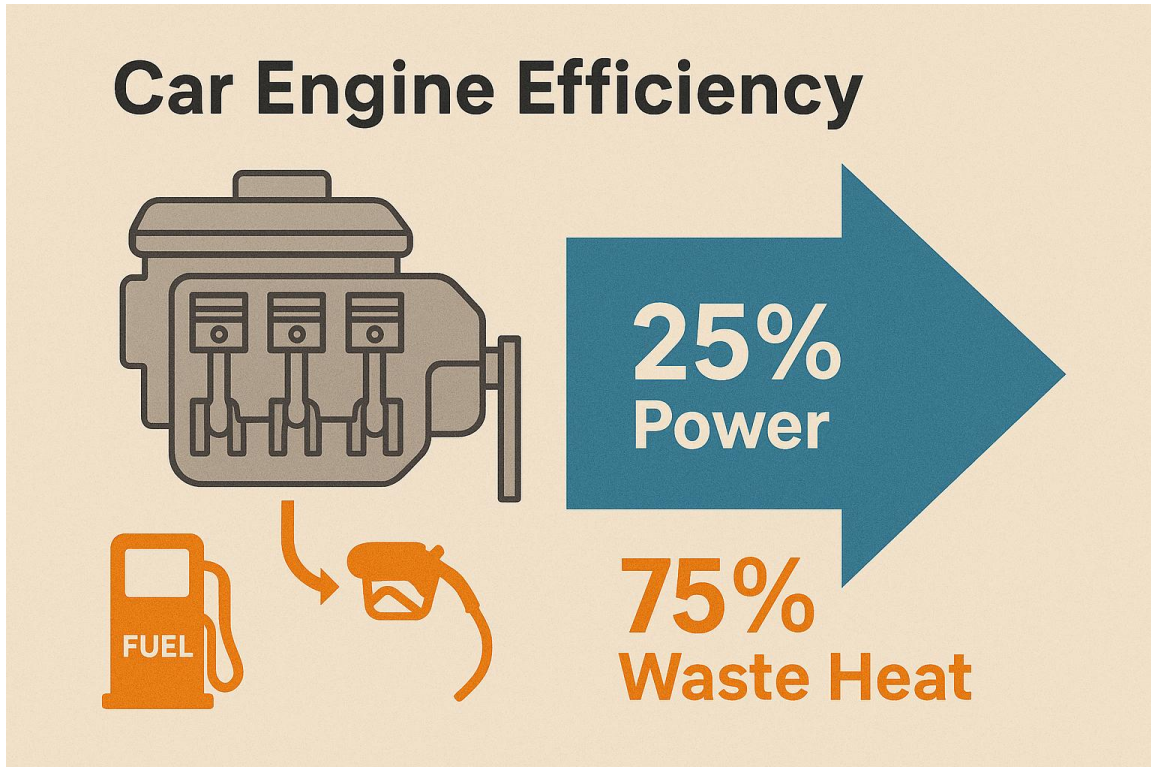
Case Study 2: Drug Concentration



The concentration of a drug in a patient's bloodstream t hours after injection is given by the function $C(t) = \frac{12t}{t^2+9}$ mg/L.

1. Rate of Change: Find the function for the rate of change of the drug concentration, $C'(t)$.
2. Peak Concentration: At what time t does the drug concentration reach its maximum?
3. Maximum Value: What is the maximum concentration of the drug in the bloodstream?
4. Long-Term Effect: What is the limit of the concentration $C(t)$ as t approaches infinity? What does this imply about the drug's presence in the body over a long period?

Case Study 3: Engine Efficiency



The efficiency E of a car engine (in percent) at a speed v (in km/h) is given by the function $E(v) = -0.01v^2 + 0.9v + 15$ for $v \in [10, 75]$.

1. Rate of Change of Efficiency: Find the function for the rate of change of efficiency, $E'(v)$.
2. Intervals of Improvement: Find the speed interval where the engine's efficiency is increasing.
3. Optimal Speed: At what speed v is the engine's efficiency at its maximum?
4. Absolute Efficiency Range: What are the absolute minimum and maximum efficiency percentages for the engine within its operational speed range $[10, 75]$?

Important links

- Answer of this worksheet - <https://www.teachoo.com/25587/5359/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/ch6-12th-application-of-derivatives/>
- Maths Class 12 - <https://www.teachoo.com/subjects/cbse-maths/class-12th/>

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