

UNIT 7: Applications of differentiation

Specific Objectives:

1. To find the gradient of a curve.
2. To solve problems involving rate of change.
3. To solve problems on maximization and minimization.
4. To do approximation.
5. To sketch simple curves.

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	Detailed Content	Time Ratio	Notes on Teaching
	7.1 Gradient	4	Students should be asked to find the geometrical meaning of the derivative of a function and the gradient of the tangent of a curve at a point. With the aid of gradient, the normal and the convexity, the region of increase and the region of decrease may be found.
	7.2 Rate of change	4	The meaning that $\frac{dy}{dx}$ is the rate of change of y with respect to x should be taught. Examples with time t as the Independent variable should be emphasized: (a) the relation between displacement and velocity; (b) water leaking from an inverted cone; (c) the rate of change of the shadow when a man is moving away from a lamp-post provide good illustrations to this topic.
	7.3 Maxima and minima	5	As a consequence of finding gradients to a curve, turning points can usually be found. They can be determined by (a) the change in sign of the first derivative; or (b) the sign of the second derivative.
	7.4 Approximation	2	It should be noted that $\frac{dy}{dx} \neq 0$ may give a maximum or a minimum. e.g. $y = x^{\frac{2}{3}}$ The geometrical meaning of differentials should be introduced. Functions with values close to special values can be approximated by differentials. Simple error estimate in the form $\frac{dx}{x}$ should be introduced.

	Detailed Content	Time Ratio	Notes on Teaching
	7.5 Simple curve sketching	3	With the knowledge in finding gradients, convexity, points of inflection, maxima and minima, students should be able to sketch curves of polynomials and rational functions of the form $\frac{ax+b}{cx+d}$. In addition, they should be able to find the horizontal and vertical asymptotes of the curves whenever they exist. It should be noted that at the point of inflection $\frac{dy}{dx}$ may or may not equal to zero.
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