

MA 231, Guided Notes §3.2

Mean Value Theorem: Suppose that $f(x)$ is continuous on $[a, b]$ and differentiable on (a, b) . Then there exists a number c , $a < c < b$, such that

$$\frac{f(b) - f(a)}{b - a} = f'(c).$$

1. Explain what the mean value theorem means geometrically.
2. Interpret the mean value theorem in terms of rates of change.
3. There are several ways for police to give speeding tickets. One is to use a radar gun. Another less common method actually uses the mean value theorem and involves using an aircraft to time how long it takes you to cover a certain distance. If you cover the distance too fast, than a police officer on the ground will pull you over and give you a ticket. Suppose you are timed by a police helicopter and it takes you 11.2 seconds to cover $1/4$ mile. Explain how the police can use the mean value theorem to give you a ticket.
4. Give graphical examples to show why the hypotheses of the mean value theorem are necessary for the conclusion to follow.