

Practice Assessment

The Mean Value Theorem

These **practice problems** are designed to help you **prepare for our course exams** and **assess your understanding** of the course material at the expected level. Aim to complete them **in class, during tutoring, office hours, or on your own**, and try to solve them **without notes or a calculator**, just like on the **actual exams**. Remember, **practice makes perfect**, so don't hesitate to **ask for help** if you get stuck.

The Mean Value Theorem: Let f be continuous over the closed interval $[a, b]$ and differentiable over the open interval (a, b) . Then, there exists at least one point $c \in (a, b)$ such that

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

1. For each of the following functions, find all numbers c that satisfy the conclusion of the Mean Value Theorem on the indicated interval.

(a) $p(x) = x^2 + 2x - 3, \quad -3 \leq x \leq 0$

(b) $r(x) = \frac{1}{(x-2)^2}, \quad 3 \leq x \leq 5$

(c) $h(x) = 3 \sin(2x), \quad 0 \leq x \leq \frac{\pi}{2}$

(d) $h(x) = \ln(x^2 + 1), \quad -2 \leq x \leq \frac{1}{2}$