Definitions

- A function f has an **absolute maximum** (or **global maximum**) at c iff $\forall x \in D$, $f(c) \geq f(x)$, where D is the domain of f.
  The number f(c) is called the **maximum value** of f on D.
- A function f has an **absolute minimum** (or **global minimum**) at c iff $\forall x \in D$, $f(c) \leq f(x)$, where D is the domain of f.
  The number f(c) is called the **minimum value** of f on D.
- The maximum and minimum values of f are called the **extreme values** of f.
- A function f has an **local maximum** (or **relative maximum**) at c iff $\forall x \in (a,b)$, $f(c) \geq f(x)$, where (a,b) is an interval containing c.
- A function f has an **local minimum** (or **relative minimum**) at c iff $\forall x \in (a,b)$, $f(c) \leq f(x)$, where (a,b) is an interval containing c.

Extreme Value Theorem

- If f is continuous on a closed interval [a,b], then f attains an absolute maximum value f(c) and an absolute minimum value f(d) at some numbers c and d in [a,b].

Critical Numbers

- **Fermat's Theorem**: If f has a local maximum or minimum at c, and if $f'(c)$ exists, then $f'(c) = 0$.
- A **critical number** of a function f is a number c in the domain of f such that either $f'(c) = 0$ or $f'(c)$ doesn't exist.
- If f has a local maximum or minimum at c, then c is a critical number of f

Closed Interval Method

- To find the absolute maximum and minimum values of a continuous function f on a closed interval [a,b]:
  - Calculate f(a) and f(b)
  - Calculate the values of f(x) for all critical points x in [a,b]
  - The largest of these values is the absolute maximum value in [a,b] and the smallest is the absolute minimum value in [a,b].