4.1

Absolute (global) max/min are the highest/lowest y values over the entire range.

Local max/mins, is a y value that is bigger/smaller than its neighbors.

\[ x^2 + 1 \text{ or } \mathbb{R} \]

no global or local max

and global min = local min = 1 occurs at \((0,1)\).

\[ \sin(x) \] has global max \(= 1 \)

occurring at \(2\pi \cdot n + \frac{1}{2} \)

has global min \(= -1 \)

at \((2\pi n + \frac{1}{2}) \cdot \pi + \frac{1}{2} \)
**Extreme Value Theorem.**

If \( f(x) \) is continuous on \([a, b]\) then \( f \) has an absolute max and an absolute min on \([a, b]\). 

---

So where can these max/mins occur? When \( f'(c) = 0 \) or \( f'(c) \) does not exist or at the end points.