Section #4.3 – Global Maxima and Minima

MA TH 2313

Definition: For any function \( f \):

- \( f \) has a global min at \( p \) if \( f(p) \leq f(x) \) for all \( x \in I \).
- \( f \) has a global max at \( p \) if \( f(p) \geq f(x) \) for all \( x \in I \).

Label all global extrema:

To find global (absolute) extrema

1. Find c.p.
2. Find \( f(\text{c.p.}) \) and \( f(\text{endpt}) \)
3. smallest # in part 2 is global min.
   largest # in part 2 is global max.

WARNING: Graph the function if a vertical asymptote is in the given interval or if no interval is given.

FACT: An endpoint may be a global extremum but not a local one.

Extreme Value Theorem (Not in book)
If \( f(x) \) is cont. on \([a, b]\) then \( f \) attains both its abs. max and its abs min. on \([a, b]\).

Example: Find abs. ext.

1. \( f(x) = \frac{1}{4}x^3 - x^2 - 3x + 1 \) on \([-2, 4]\)
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2. \( f(x) = x^3 - 6x^2 \) on \([2, 5]\)

3. \( f(x) = \frac{x^2}{x-1} \) on \([-1, 3]\)

1. Classify each point as c.p, local max/min, global ext., and/or an endpoint.

(a) 
(b) 
(c) 
(d) 
(e) 
(f) 
(g) 
(h) 
(i) 
(j)