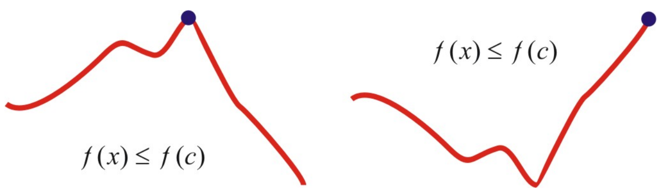
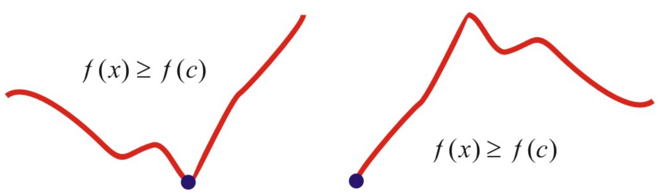
3.2 Maximum and Minimum on an Interval. Extreme Values

A Global Maximum
A function f has a *global (absolute) maximum* at $x = c$ if $f(x) \le f(c)$ for all $x \in D_f$.
$f(c)$ is called the *global (absolute) maximum value*.
$(c, f(c))$ is called the *global (absolute) maximum point*.

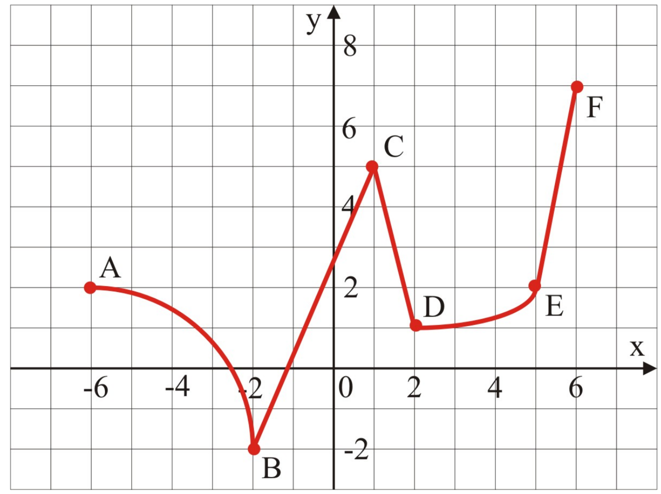


B Global Minimum
A function f has a *global (absolute) minimum* at $x = c$ if $f(x) \ge f(c)$ for all $x \in D_f$.
$f(c)$ is called the *global (absolute) minimum value*.
$(c, f(c))$ is called the *global (absolute) minimum point*.



C Extremum and Extrema
An *extremum* is either a minimum or a maximum (value, point, local or global).
Extrema is the plural of extremum.

Ex 1. Find extrema for the function represented in the figure below by its graph.



D Global (Absolute) Extrema Algorithm
To find the global (absolute) extrema for a *continuous* function f over a closed interval $[a,b]$:
1) identify the *critical* numbers over (a,b)
2) find the *values* of the function $f(c)$ at each critical number c in (a,b)
3) find the *values* $f(a)$ and $f(b)$
4) from the values obtained at part 2) and 3):
- the *largest* represents the *global (absolute) maximum* value
- the *least* represents the *global (absolute) minimum* value

Note. c is a critical number if either $f'(c) = 0$ or $f'(c)\ DNE$

Ex 2. Find extrema for $f(x) = 3x^4 - 4x^3$ over $[-1,2]$.

Ex 3. Find extrema for $f(x)=\frac{x^2-1}{x^2+1}$ over $[-1,3]$.	Ex 4. Find extrema for $f(x)=(x+1)^2\sqrt[3]{x-1}$ over $[0,1/2]$.

Reading: Nelson Textbook, Pages 130-134
Homework: Nelson Textbook: Page 136 #3ace, 4abe, 7ab, 10, 11

