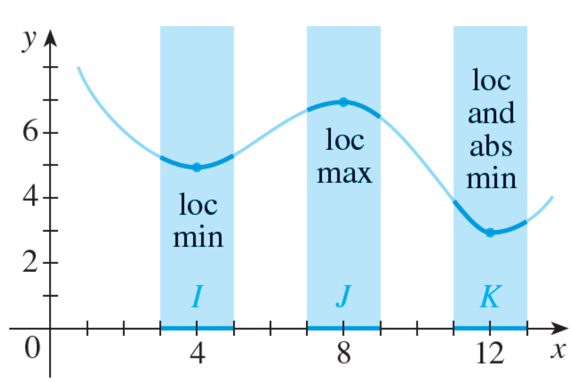
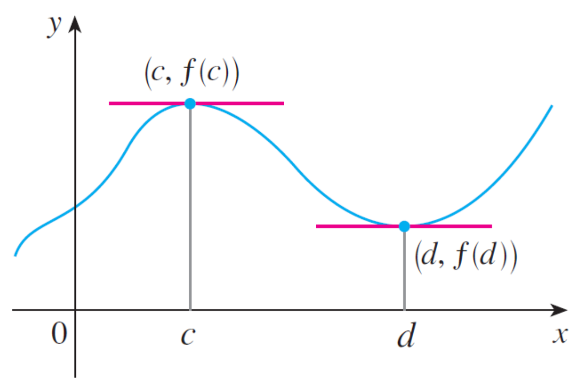
CH 4: Applications of Differentiation

4.1 Maximum and Minimum value

1. the local extrema of a functions are the local minimums and local maximums
2. a function $f(x)$ has a **local maximum** at $x = c$ if $f(c) \geq f(x)$ for all values x in some open interval around c
3. a function $f(x)$ has a **local minimum** at $x = c$ if $f(c) \leq f(x)$ for all values x in some open interval around c (open interval around c means that the immediate values to the left and to the right of c are in that open interval)
4. a function $f(x)$ has an **absolute maximum** at $x = c$ if $f(c) \geq f(x)$ for all values $x \in \text{Domain}(f)$
5. a function $f(x)$ has an **absolute minimum** at $x = c$ if $f(c) \leq f(x)$ for all values $x \in \text{Domain}(f)$
6. **Fermat's Theorem**: If f' exists at a local/global maximum or minimum, then $f' = 0$ at that point.





7. **Extreme Value Theorem:**

$$f \text{ is continuous on } [a, b]\text{, then } f \text{ has an absolute max at } c \text{ and and absolute min at } d\text{, where } c, d \in [a, b]$$

8. a **critical number** of a function f is a number c in the domain of f such that either $f'(c) = 0$ or $f'(c)$ does not exist (particularly, local extrema are critical numbers)
9. **Closed interval method:** if f is continuous on a closed interval $[a, b]$, then the absolute min/max occur at the critical points or at the end points a or b