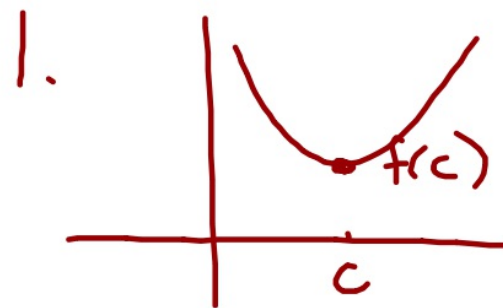
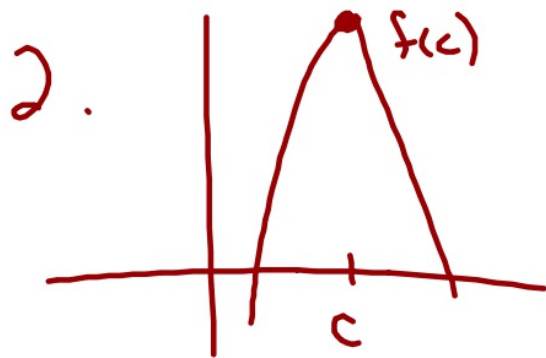


3.1 Extrema

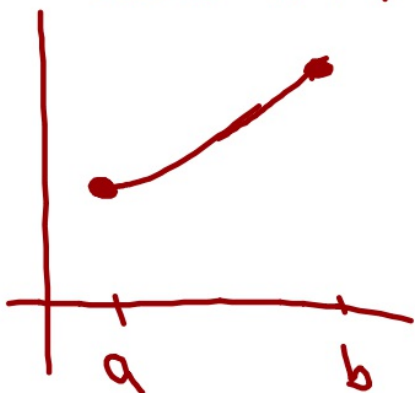
WCID? I can find extrema

A. Extrema - on a function with a given interval,

1. If $f(c) < f(x)$ for all x , $f(c)$ is a relative minimum
2. If $f(c) > f(x)$ for all x , $f(c)$ is a relative maximum



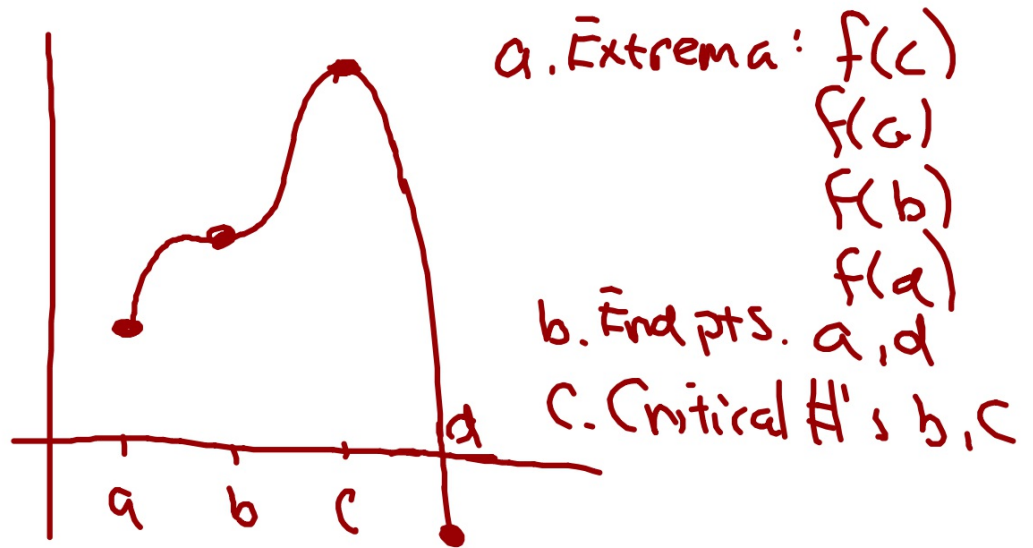
3. Extreme Value Theorem - if f is continuous on $[a, b]$, then f has both a max and min



B. Critical Numbers · values where
 $f'(x) = 0$ or DNE

1. Extrema occur at critical numbers
OR endpoints

2. Ex.



$f(d)$ is an absolute min

$f(c)$ is an absolute max

3. How to find CV

$$\text{Let } f'(x) = 0.$$

Go.

Ex. Find the critical values of

$$g(x) = x^2(x^2 - 4)$$

$$g(x) = x^4 - 4x^2$$

$$g'(x) = 4x^3 - 8x$$

$$0 = 4x^3 - 8x$$

$$0 = 4x(x^2 - 2)$$

$$\frac{0}{4} = \frac{4x}{4}$$

$$x = 0$$

$$0 = x^2 - 2$$

$$+2 \quad +2$$
$$\sqrt{2} = \sqrt{x^2}$$

$$x = \pm\sqrt{2}$$

Ex. Find any CV of $h(x) = 2\sec x + \tan x$,
 $0 < x < 2\pi$

$$0 = 2\sec x \tan x + \sec^2 x$$

4. To Find Absolute Extrema
 - a. Find all CV
 - b. Evaluate CV in the original
 - c. Evaluate your endpoints
 - d. Highest = max in the original
Lowest = min

$$\text{Ex. } f(x) = 3x^4 - 4x^3 \quad [-1, 2]$$

$$0 = 12x^3 - 12x^2$$

$$0 = 12x^2(x-1)$$

$$0 = 12x^2 \quad 0 = x-1$$

$$x = 0, 1$$

$$f(-1) = 3(-1)^4 - 4(-1)^3 = 7$$

$$f(0) = 0$$

$$f(1) = -1$$

$$f(2) = \underset{48}{3(2)^4} - \underset{32}{4(2)^3} = 16$$

