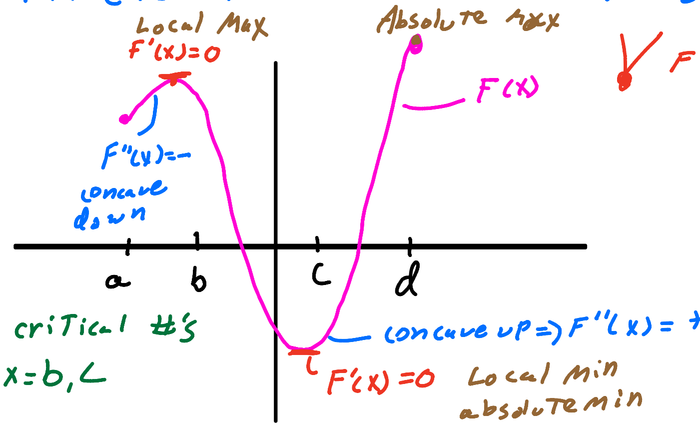
Period 3, Dec 4, 2024

Extrema Relative (Local) Max/mins

$F'(x) = \text{slope} = \frac{dy}{dx}$

$F''(x) = \frac{d(\text{slope})}{dx} = \text{concavity}$



critical #'s

$x = b, c$

$F'(x) = \emptyset$

$F''(x) = + = \text{concave up} = ☺ = \text{Min}$

$F''(x) = - = \text{concave Down} = ☹ = \text{Max}$

$F''(b) = - = \text{concave Down} = \text{Max}$

$F''(c) = + = \text{concave up} = \text{Min}$

1. Step 1 Find $F'(x) = 0$ or $\emptyset$
   X-values = critical #'s

2. Step 2 Find $F''(x)$ To determine
   concavity ⇒ $F''(x) = + = \text{concave up} = \text{Min (Local)}$
   concavity ⇒ $F''(x) = - = \text{concave Down} = \text{Max (Local)}$

3. Plug in Endpoints and critical #'s To Find absolute max and mins

X	Y
b	
c	
a	
d	

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b) $h(t) = \frac{1}{t^2+1}$ on $[-1, 1]$.

$h(T) = (T^2+1)^{-1}$

$h'(T) = -1(T^2+1)^{-2}(2T) = \frac{-2T}{(T^2+1)^2}$

critical #'s

$T = 0$

$\frac{-2T}{(T^2+1)^2} = 0$ or $\frac{-2T}{(T^2+1)^2} = \emptyset$

$T = 0$

$$h''(T) = \frac{-2(T^2+1)^2 - (-2T)(2(T^2+1)(2T))}{((T^2+1)^2)^2} = \frac{2(T^2+1)\left[-(T^2+1) + 4T^2\right]}{(T^2+1)^4} = \frac{2(T^2+1)\left[3T^2-1\right]}{(T^2+1)^4}$$

Plot critical #'s, End pts

$h(0) = \frac{1}{0^2+1} = 1$ — Absolute Max, Local Max

$h(-1) = \frac{1}{(-1)^2+1} = \frac{1}{2}$

$h(1) = \frac{1}{(1)^2+1} = \frac{1}{2}$

Absolute min

$T^2 + 1 = 0$

$T^2 = -1$

$T = \pm i$

$h''(0) = \frac{2 \cdot 1 \cdot -1}{1} = -$

Concave Down

Max

$3x^2 + \underline{11}x + 6 = \underbrace{3x^2 + 9x} + \underbrace{2x + 6}$

$\underbrace{3x^2 + 11x + 6}_{3 \cdot 6 = 18}$

$18 \to 9 \quad 2$

$3x(x+3) + 2(x+3)$

$(x+3)(3x+2)$

$9 \cdot 2 = 18$

$9 + 2 = 11$