

3.3: Relative Extrema/Intervals of Increasing/decreasing  
(1st derivative test to find relative extrema)  
Sketching  $f'$  and  $f''$  given  $f$

3.4: POI/Intervals of Concavity  
2nd derivative test to find relative extrema

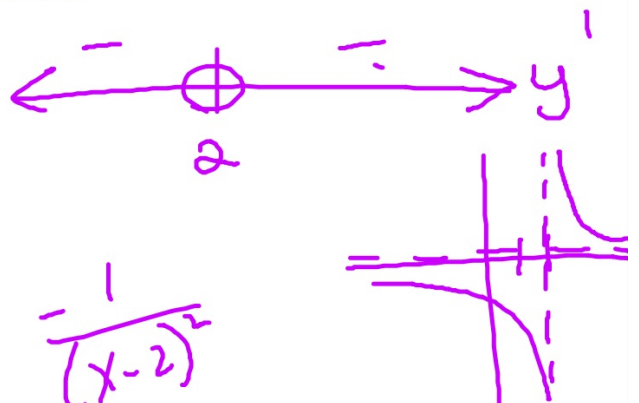
3.6: Curve sketching given a function  
Curve sketching given characteristics

3.7: Optimization

$$y = \frac{1}{x-2}$$

$$y = (x-2)^{-1}$$

$$y' = -(x-2)^{-2} \cdot 1 = -\frac{1}{(x-2)^2}$$



~~decr.  
( $-\infty, \infty$ )~~

$$f(x) = 2x - 3x^{2/3}$$

$$f'(x) = 2 - 2x^{-1/3}$$

$$= 2 - \frac{2}{x^{1/3}}$$

$$f'(x) = \frac{2x^{1/3} - 2}{x^{1/3}}$$

slope 0

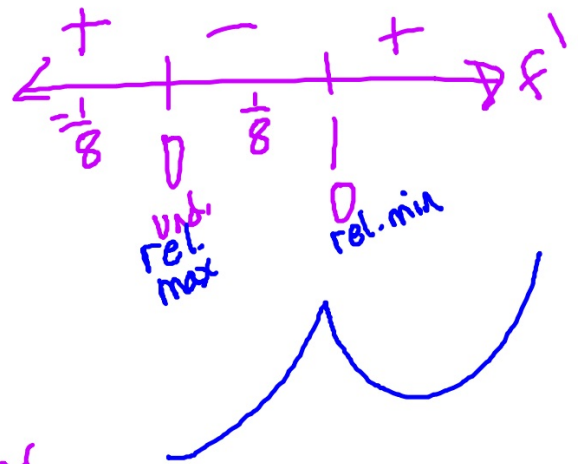
$$2x^{1/3} - 2 = 0$$

$$x = 1$$

slope undefined

$$x = 0$$

$$D: (-\infty, \infty)$$



2c.)

max volume

Primary

$$V = lwh$$

$$V = (24 - 2x)(24 - 2x)x$$

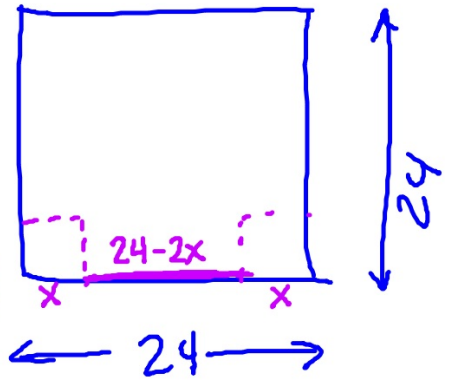
$$V = (24^2 - 96x + 4x^2)x$$

$$V = 576x - 96x^2 + 4x^3$$

$$x = 4$$



max value  
 $V = 1024 \text{ in}^3$



$$V' = -192x + 12x^2 + 576$$

$$0 = 12x^2 - 192x + 576$$

$$0 = 12(x^2 - 16x + 48)$$

$$0 = 12(x - 12)(x - 4)$$

$$x = \cancel{12}, 4$$