

SIGN of $\frac{dy}{dx}$:
 f'

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$\frac{dy}{dx} = 0$: tangent line horizontal :

"x" value Called CRITICAL number

$(x, f(x))$ called "CRITICAL POINT
on graph

$\frac{dy}{dx} \Big|_{x=x_0} > 0$ "y INC at x_0 "

$\frac{dy}{dx} \Big|_{x=x_0} < 0$ "y DEC at x_0 "

INTERVAL of INCREASE

Interval I (open, closed, ...)

INC on I : $\left\{ \begin{array}{l} \text{two point } x_1 < x_2 \Rightarrow f(x_1) < f(x_2) \\ \text{of } f' > 0 \text{ on } I \end{array} \right.$

Example $y = x^2 - 4x + 4$ $\left\{ \begin{array}{l} \text{POS for } x > 2 \text{ INC on } (2, \infty) \\ \text{NEG for } x < 2 \text{ DEC on } (-\infty, 2) \end{array} \right.$

$\frac{dy}{dx}$ SIGN same on I is an interval OF

SIGN can change ONLY at $\frac{dy}{dx} = 0$ and also

SPECIAL NUMBERS $\div 0$

Example 1.3.2 INCREASE DEC

[CRITICAL NOS
SPECIAL

$$y = \frac{x^3}{x-2}$$

Mark on Line. (p-193)

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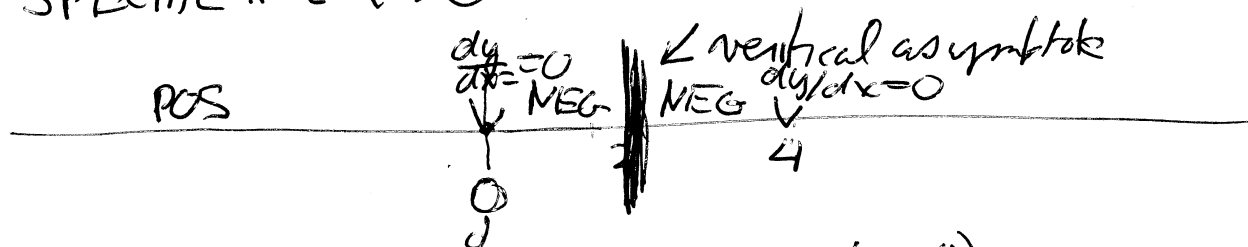
$$y = \frac{x^2}{x-2}; \quad \frac{dy}{dx} = \frac{(x-2)(2x) - x^2(1)}{(x-2)^2} = \dots = \frac{x^2 - 4x}{(x-2)^2}$$

SIMPLIFY " cuz you need it

CR. NOS

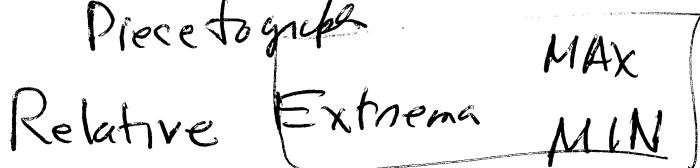
$$x^2 - 4x = (x-4)x; \quad x=0, x=4$$

SPECIAL $x=2$ ($\div 0$)



Next SIGN of $\frac{dy}{dx}$: Formula $\frac{x(x-4)}{(x-2)^2}$

Piece to graph



Relative [near LOCAL MAX] $f(c) \geq f(x)$ all x
 p-192 near c [both sides!]

Test for Extrema:

f defined and cont. at c

only C_{int} CRITICAL NO or $\frac{dy}{dx}$ does not LOCAL MAX where $\frac{dy}{dx}$

or special m

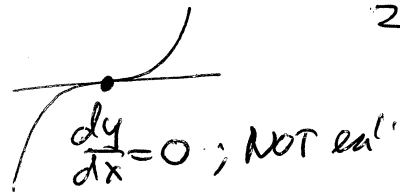
"cuz"



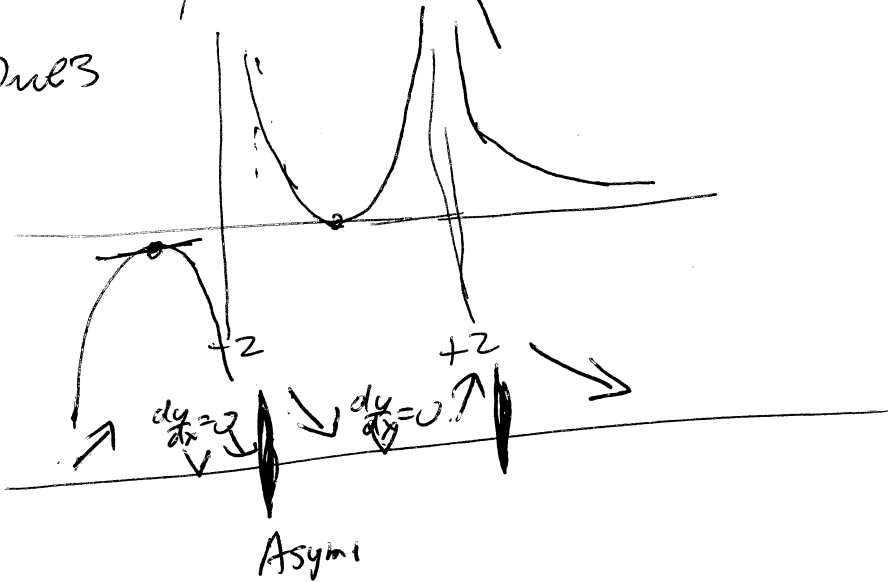
Pictures

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$$\frac{dy}{dx} = 0$$



Prob 3



#19 ~~$x^3 + \frac{1}{x^2}$~~ $x^2 - \frac{1}{x^2}$ INT INC/DEC
 $x^2 - \frac{1}{x^2}$ $x=0$ SPECIAL

$\frac{dy}{dx} = 2x - \frac{2}{x^3}$; Solve $2x = \frac{2}{x^3}$; $x^4 = 1$, $x = +1, -1$

