① $f(x)=\frac{x^4-12x^2+3x}{x}$ Absolute Extrema $(-2,3]$

$f(x)= x^3-12x+3$

$f'(x)=3x^2-12=3(x^2-4)=0 \quad x=\pm 2$

$f(-2)=-8+24+3=19$ Rel Max

$f(2)=8-24+3=-13$ Rel Min

$f(3)=27-36+3=-6$

(2,-13) Absolute Min

② Why doesn't Rolles work? $y=\frac{x^2-4}{x}$ $[1,3]$

Discontinuous at $x=0$ (Not in interval) Cont. on Interval

$y'=\frac{2x(x)-(x^2-4)(1)}{(x)^2}=\frac{2x^2-x^2+4}{x^2}=\frac{x^2+4}{x^2}$ Diff. on Interval

$y=\frac{(1)^2-4}{1}=-3 \neq \frac{5}{3}=y=\frac{(3)^2-4}{3}$

③ Why Mean Value Th doesn't work? $y=\sqrt{x-5}$ $[4,10]$

$x\geq 5$ is the domain (4 is not continous.)

④ $f(5)=3$, $f'(5)=8$, $f''(5)=0$, $f''(4)<0$, $f''(6)>0$

What do you know about $(5,3)$?

$(5,3)$ is a P of I because concavity changes & $f''(5)=0$

⑤ $f(2)=-5$, $f'(2)$ does not exist, $f''(2)=-4$

What do you know about $(2,-5)$?

$(2,-5)$ is a Rel. Max because $f'(2)$ is DNE & Second Derivative test says $f''(2)$ is concave down ∩.