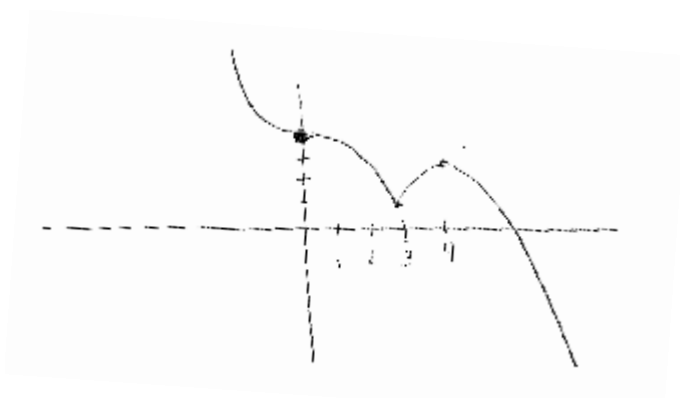
1. Does not contradict because Rolle's Theorem does not apply.
2. CN at $x=-1$, $f''(-1)=e^{-1}+(0)e^{-1}>0$ so relative min at $\left(-1,-e^{-1}\right)$
3. CNs at $x=b,c,d,e,f,g$; relative minimums at $x=c,e$ relative maximums at $x=b,d,f$
4. Absolute min at $\left(\frac{3\pi}{4},-\frac{1}{2}\right)$; Absolute max at $\left(\frac{\pi}{4},\frac{1}{2}\right)$
5. Graph has a an absolute maximum at $x=a$ but no absolute minimum.
6. One possibility is $f(x)=\dfrac{2x^3+101}{3x(x+1)(x-1)}$
7. VA: $x=2$; HA: none; OA: $y=3x+11$
8. False. It only means it has a horizontal tangent line. Example $f(x)=x^3$ at $(0,0)$
9. a) $\begin{aligned} f'(x)&=4x^3-12x^2\\ &=4x^2(x-3)\end{aligned}$ b) $x=0,3$ c) No relative Max; Relative Min $(3,-17)$

   d)Increasing on $(3,\infty)$ e) Decreasing on $(-\infty,0)\cup(0,3)$ f) $\begin{aligned} f''(x)&=12x^2-24x\\ &=12x(x-2)\end{aligned}$

   g) Concave up on $(-\infty,0)\cup(2,\infty)$ h) concave down on $(0,2)$ i) IPs at $(0,10)$ & $(2,-6)$
10.



11. $f''(-3)>0$ so relative min at $x=-3$; $f''(0)<0$ so relative max at $x=0$; $f''(3)>0$ so relative min at $x=3$

12. $dV=3s^2ds$ and $ds=\dfrac{\pm.027}{27}=\pm.001$
13. $y=\dfrac{1}{4}x+1$
14. $\Delta y=.02701$ $dy=.025$
15. 900 cm^3/s
16. $-\dfrac{1}{6}$ rad/s

17. 400 ft by 800 ft; max area is 320,000 ft^2

18. 200 m for the front and 800 meters total for the other three sides. minimum cost is $ 12,000

19. a)0 b) ∞ c)0 d)1 e)0