4.1 Day 2

Saturday, November 03, 2012
8:02 PM

p. 194: 11, 18, 20, 22, 23, 25, 29, 45-47

11. $f(x) = \frac{1}{x} + \ln x \quad [0.5, 4]$

$f'(x) = -x^{-2} + \frac{1}{x}$ EVT applies!

$0 = \frac{-1}{x^2} + \frac{1}{x}$

$0 = \frac{-1+x}{x^2}$

$-1 + x = 0 \quad x = 1$ critical point

we must check the critical point & endpoints

$f(1) = \frac{1}{1} + \ln 1 = 1 + 0 = 1$ minimum value $(1,1)$

$f(0.5) = \frac{1}{0.5} + \ln(.5) = 1.307$ Local max $(.5, 2+\ln .5)$

$f(4) = \frac{1}{4} + \ln 4 = 1.636$ Maximum $(4, \frac{1}{4} + \ln 4)$

18. $f(x) = x^{3/5} \quad (-2, 3]$ EVT Doesn't apply!!

$f'(x) = \frac{3}{5}x^{-2/5}$

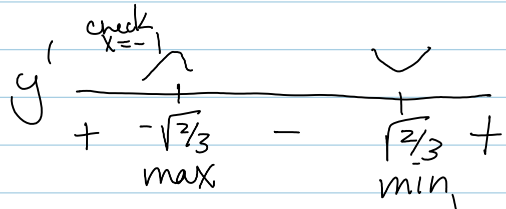
$f'(x)$ is undefined at $x=0$ therefore it is a critical value.

when $x<0$ $f(x)<0$ when $x>0$ $f(x) \geq 0$ therefore @ $x=0$ is neither a max or min.

We need to check the only endpoint $x=3$ $f(3) = 3^{3/5}$ will be the highest point therefore maximum $(3, 3^{3/5})$

20. $y = x^3 - 2x + 4$

$y' = 3x^2 - 2 \qquad 0 = 3x^2 - 2 \qquad x = \pm\sqrt{2/3}$



$y' = 3x - 2$ $0 = 3x^2 - 2$ $x = \pm\sqrt{2/3}$ max   min

Local max! $\left(-\sqrt{2/3},\ 4 + \frac{4\sqrt{6}}{9}\right)$ Local Min $\left(\sqrt{2/3},\ 4 - \frac{4\sqrt{6}}{9}\right)$

y has a local max @ $x = -\sqrt{2/3}$ b/c y' goes from + → −.

y has a local min @ $x = \sqrt{2/3}$ b/c y' goes from neg to pos @ $x = \sqrt{2/3}$

22. $y = x^3 - 3x^2 + 3x - 2$

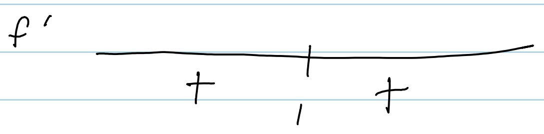
$y' = 3x^2 - 6x + 3$

$0 = 3x^2 - 6x + 3$

$x = \frac{6 \pm \sqrt{36 - 4(3)(3)}}{2(3)}$

$x = 1$

sign chart



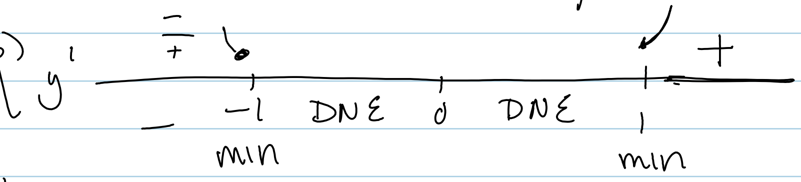
therefore no max or min

23. $y = \sqrt{x^2 - 1} = (x^2 - 1)^{1/2}$ D: $(-\infty, -1] \cup [1, \infty)$

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

$0 = \frac{x}{\sqrt{x^2 - 1}}$ $x \neq 1$ or -1

critical values $x = -1, 1$



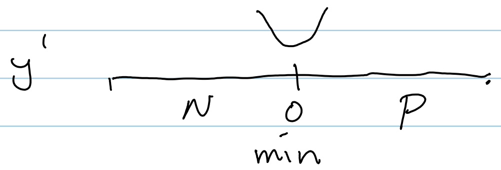
* y has a local min of 0 @ $x = -1$ b/c $y' < 0$ to the left of −1

$x = -1$ $\sqrt{(-1)^2 - 1} = 0$

* y has a local min of 0 @ $x = 1$ b/c $y' > 0$ to the right of 1

$x = 1$ $\sqrt{1^2 - 1} = 0$

25. $y = \frac{1}{\sqrt{1 - x^2}}$ Domain $(-1, 1)$



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

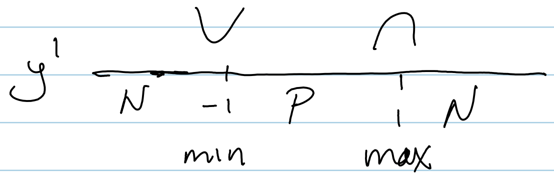
$0 = \frac{x}{(1 - x^2)^{3/2}}$ $x = 0$ critical value $y = \frac{1}{\sqrt{1 - 0^2}} = 1$

y has a minimum value of 1 @ $x = 0$ since y' goes from Neg.

to Pos. @ $x=0$

29. $y=\frac{x}{x^2+1}$

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



$0=\frac{-x^2+1}{(x^2+1)^2}$

$0=-x^2+1$

$-1=-x^2$

$1=x^2$

$x=\pm1$ Critical values

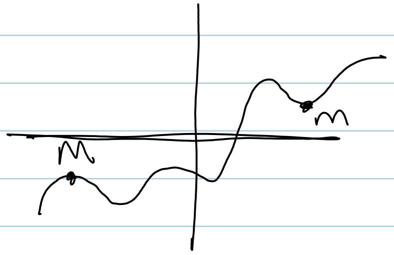
$y=\frac{-1}{(-1)^2+1}=-1/2$ $y=\frac{1}{1^2+1}=1/2$

☆ y has a local min of $-1/2$ @ $x=-1$ b/c y' goes from neg. to pos. @ $x=-1$

☆ y has a local min of $1/2$ @ $x=1$ b/c y' goes from positive to negative @ $x=1$.

45. False. The maximum could occur at a corner where $f'(c)$ DNE

46. False Consider the graph below



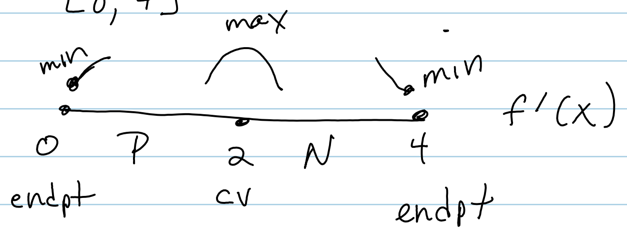
47. E $f(x)=4x-x^2+6$ $[0,4]$

$f'(x)=4-2x$

$0=4-2x$

$2=x$

Critical value



$f(2)=4(2)-2^2+6$

$=8-4+6$

$=10$