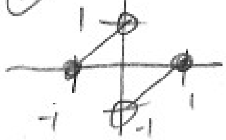
AP Cal 3.1 p. 193 (2–18 even, 26, 27, 34, 37, 40, 44, 45, 46, 50, 51) Korpi, per $\sqrt{-1}$

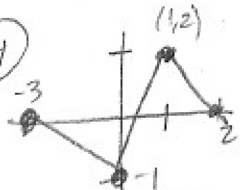
(2)



Extreme Values
Max: DNE
MIN: DNE

No Rel Extrema.

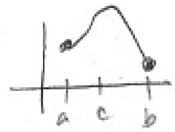
(4)



Extreme Values:
Max: 2
MIN: −1

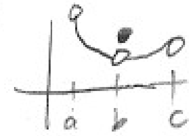
Rel Max: 2
Rel Min: −1

(6)



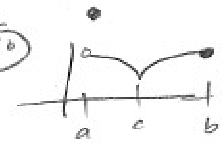
Cont on closed interval, so guaranteed A Max & Min
Max: $f(c)$
Min: $f(b)$

(8)



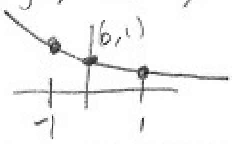
No guarantee by E.V.T.
Rel Max is $f(b)$
No Max or Min

(10)



No guarantee by EVT. Rel Min @ $x=c$
Max: $f(a)$
Min: $f(c)$

(12) $g(x)=e^{-x}$, $-1\le x\le 1$

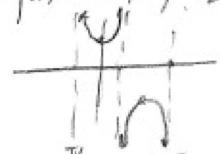


Max: $g(-1)=e$
Min: $g(1)=e^{-1}=\frac{1}{e}$
$g'(x)=-e^{-x}=0$
No CVS.

(14) $k(x)=e^{-x^2}$, $-\infty<x<\infty$

Max: $g(0)=1$
No Min (HA @ $y=0$)
$k'(x)=-2xe^{-x^2}=0$
$x=0$ c.v
$k(0)=1$

(16) $g(x)=\sec x$, $-\frac{\pi}{2}<x<\frac{3\pi}{2}$



$g'(x)=\sec x\tan x=0$
$\sec x=0$, $\cos x=$ DNE, No Sol. $\}$ $\tan x=0$, $x=0,\pi$

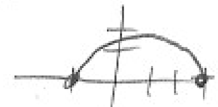
$g(-\pi/2)=\infty$ OPEN INTERVAL
$g(\frac{3\pi}{2})=-\infty$
$g(0)=1$
$g(\pi)=-1$
No Max or Min

(18) $f(x)=x^{3/5}$, $-2<x\le 3$
$f'(x)=\frac{3}{5}x^{-2/5}=\frac{3}{5\sqrt[5]{x^2}}=$ DNE when $x=0$
$f(3)=\sqrt[5]{3^3}=\sqrt[5]{27}$ ← Max
$f(0)=0$ Not a min since open on left (∞ low approaching $y=\sqrt[5]{-8}$

(26) $y=\frac{1}{\sqrt[3]{1-x^2}}$
$x\ne 1,-1$
$y=(1-x^2)^{-1/3}$
$y'=-\frac{1}{3}(1-x^2)^{-4/3}(-2x)$
$y'=\frac{2x}{3\sqrt[3]{(1-x^2)^4}}$
$y'=0$ @ $x=0$
$y'=$ DNE @ $x=\pm 1$ ← Not in domain of y
only c.v. @ $x=0$
from graph: $\boxed{\text{Local Min @ }(0,1)}$

(27) $y=\sqrt{3+2x-x^2}$ $D_y: \{x \mid -1\le x\le 3\}$
$y'=\frac{1}{2}(3+2x-x^2)^{-1/2}(-2x+2)$
$=\frac{2-x}{\sqrt{3+2x-x^2}}=0$
when $x=2$
$y'=$ DNE when $x=-1,3$

Rel Max @ $(2,\sqrt{3})$
Max @ $(2,\sqrt{3})$
Mins @ $(-1,0)$, $(3,0)$



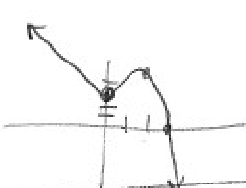
(34) $k(x)=|x+1|+|x-3|$, $-\infty<x<\infty$
$k'(x)=$ DNE @ $x=-1,3$
$k(-1)=4$, $k(3)=4$ > Min value of $y=4$ $\forall x\in(-1,3)$

(37) $y=x\sqrt{4-x^2}$
$y'=\frac{\sqrt{4-x^2}}{1}-\frac{2x^2}{2\sqrt{4-x^2}}$
$=\frac{2(4-x^2)-2x^2}{2\sqrt{4-x^2}}$
$=\frac{8-4x^2}{2\sqrt{4-x^2}}=0$
when $x=\pm\sqrt{2}$

$y'=$ DNE when $x=\pm 2$

Rel Min @ $x=-\sqrt{2}$, $y=-2\sqrt{2}$
Rel Max @ $x=\sqrt{2}$, $y=2\sqrt{2}$

(40) $y=\begin{cases}3-x, & x<0\\ 3+2x-x^2, & x\ge 0\end{cases}$ $-(x^2-2x-3)$ $(x-3)(x+1)$
$y'=\begin{cases}-1 & x<0\\ 2-2x, & x>0\end{cases}$
$\lim_{x\to 0^-}y'=-1\ne 2=\lim_{x\to 0^+}y'$
So $\boxed{x=0 \text{ is a c.v.}}$
$y'=0$ when $\boxed{x=1}$

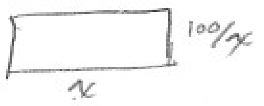


Rel Min @ $x=0, y=3$
Rel Max @ $x=1, y=4$

pg 1/2

AP Cal ABC
§ 4.1 cont

(44) $P(x) = 2x + \frac{200}{x}, \quad 0 < x < \infty$

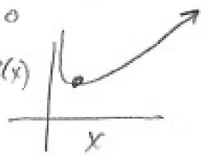


a) $P'(x) = 2 - \frac{200}{x^2} = 0$

$2 = \frac{200}{x^2}$

$x^2 = 100$

$\boxed{x = 10}$



$P'(x) = DNE$

$\boxed{x = 0} \leftarrow$ Not in domain

Rel Min @ $x = 10$, $P(10) = 40$

b) The smallest Perimeter is 40 units, and it occurs when $x = 10$, which will make the Rectangle a 10×10 square.

(45) T or F:

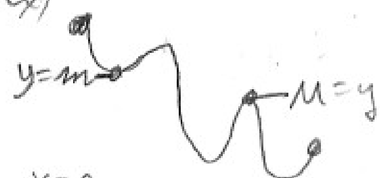
If $f(c)$ is a Local Max of cont. function on (a,b), then $f'(c) = 0$?

True, Rel Extrema occur at CVs, and if $f'(c) = 0$, then $x = 0$ is a C.V.

(46) T or F: If m is a Local Min and M is a Local Max of cont function f on (a,b), then $m < M$.

False;

ex)



$m > M$

(50) M.C. if $f(x)$ is Even (y-axis symm) $\ni D_f: \mathbb{R}$ has local Max @ $x = a$, then $f(-a) = f(a)$ since $f(x)$ is even.

↑ y-axis Reflection

So $f(-a)$ is ALSO a Local Max

$\boxed{B}$

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

a) Does $f'(2)$ exist?

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

$f'(2) = \frac{2}{3\sqrt[3]{0}} = DNE$

So $\boxed{f'(x) \text{ does not exist}}$

b) Since $f(2)$ is defined $(=0)$, $x = 2 \in D_f$

So $x = 2$ is a C.V. of f.

$f(x)$:

$x = 2$ is a Rel Min

since $f'(x) \neq 0$ and is only undefined at $x = 2$, $x = 2$ is the ONLY CV (Rel Extrema in this case.)

c) No, unless we specify a closed interval, we do not violate the EVT with only an abs min since the domain is OPEN (all $\mathbb{R}$).

d) For $f(x) = (x-a)^{2/3}$ everything above holds. We have only a Rel Min @ $x = a$.