AP Calculus AB

WS 8.3 - Review 3

1) $f(x) = 2x^3+6x^2-6x+7$

$f'(x) = 6x^2+12x-6$

$f''(x) = 12x+12 = 0$ $\quad f''$: − | + at -1

$x = -1$

$f(-1) = 17$

$f(x)$ has a P.O.I @ $(-1,17)$ b/c $f''(x)$ Δs signs

2) $y = -x^2+4x+25$ $[-2, 3]$

$y' = -2x+4 = 0$

$x = 2$

x	y
−2	13
2	29
3	27

y has a max of $y=29$ @ $x=2$.

3) $f(x) = x^3-6x^2$ on $[1,2]$

$f'(x) = 3x^2-12x = 0$

$3x(x-4) = 0$

$x=0 \quad x=4$

x	f(x)
1	−5
2	−16

$f(x)$ has a min of $y=-16$ @ $x=2$

4) $f'(x)<0 \rightarrow f$ is dec
$f''(x)>0 \rightarrow f$ is concave up } point A

5) $f'(x)=0 \rightarrow$ horiz. tangent
$f''(x)>0 \rightarrow f$ is con up } point E

6) $f'(x)>0 \rightarrow f$ is inc
$f''(x)>0 \rightarrow f$ is con up } point B

7) $f(x) = 2x^3+3x^2$

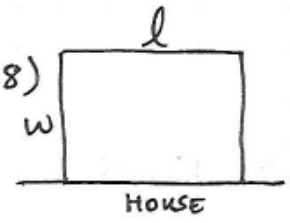
$f'(x) = 6x^2+6x = 0$

$6x(x+1) = 0$ $\quad f'$: + | − | + at -1, 0

$x=0 \quad x=-1$

$f(x)$ is inc on $(-\infty,-1)$ & $(0,\infty)$ b/c $f'(x)>0$

8)



$l+2w = 160 \rightarrow l = 160-2w$

$A = lw$

$A = (160-2w)\cdot w$

$A = 160w-2w^2$

$A' = 160-4w = 0$

$w = 40$

$l = 80$

A' : + | − at 0, 40, 80

To maximize area, $w = 40$ ft & $y = 80$ ft.

$A'>0$ on $(0,40)$ &
$A'<0$ on $(40,80)$

9) $f'(a)<0$

f is decreasing

(C) III only

10) $F(x) = \int_4^{x^2} 3\sin(t^2)\,dt$

$F'(x) = 3\sin(x^4)\cdot 2x$

11) $f(x) = 2x^3-6x^2+1$

ENDPOINTS

$x=-2$

$x=3$

C.V.

$f'(x) = 6x^2-12x = 0$

$6x(x-2) = 0$

$x=0 \quad x=2$

x	f(x)
−2	−39
0	1
2	−7
3	1

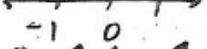
$f(x)$ has an abs. min @ $(-2,-39)$.

12) $f(x) = 2x^4 - 4x^2$

$f'(x) = 8x^3 - 8x = 0$

$8x(x^2 - 1) = 0$

$x = 0 \quad x = \pm 1$

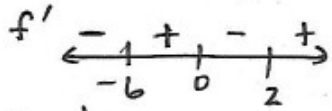


f has a local min @ $x = -1$ & $x = 1$
b/c f' Δs signs from − to +

f has a local max @ $x = 0$
b/c f' Δs signs from + to −

13) $f'(x) = x(x-2)^3(x+6)^5$

$x = 0 \quad x = 2 \quad x = -6$



f has 2 min & 1 max

14) $f'(x) > 0 \rightarrow$ f is inc.
$f''(x) > 0 \rightarrow f'$ is inc } point G

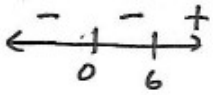
f is concave up

15) $f(x) = x^4 - 8x^3 + 14$

$f'(x) = 4x^3 - 24x^2 = 0$

$4x^2(x-6) = 0$

$x = 0 \quad x = 6$



f(x) is inc on $(6, \infty)$
b/c $f'(x) > 0$.

16) $F(x) = \int_2^{2x} \ln(\cos(t^3))\,dt$

$F'(x) = \ln(\cos((2x)^3)) \cdot 2$

17) $\frac{d}{dw} \int_3^w \sin t\,dt = \sin w$