AP Calculus

Absolute Extrema

Name________________________ Pe

Day 5 Application of Derivatives

1-8: Find the absolute maximum and absolute minimum values of f on the given interval.

1. $f(x)=12+4x-x^2$, $[0,5]$

$f'(x)=4-2x=0$

$x=2$

x	y
0	12
2	16
5	7

abs max of 16 at $x=2$

abs min of 7 at $x=5$

2. $f(x)=2x^3-3x^2-12x+1$, $[-2,3]$

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

$x=2,\ x=-1$

x	y
-2	-3
-1	8
2	-19
3	-8

abs max of 8 at $x=-1$

abs min of -19 at $x=2$

3. $f(x)=x^3-6x^2+5$, $[-3,5]$

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

$x=0\quad x=4$

x	y
-3	-76
0	5
4	-27
5	-20

abs max of 5 at $x=0$

abs min of -76 at $x=-3$

4. $f(x)=(x^2-1)^3$, $[-1,2]$

$f'(x)=3(x^2-1)^2\cdot 2x$

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

x	y
-1	0
0	-1
1	0
2	27

abs max of 27 at $x=2$

abs min of -1 at $x=0$

AP Calculus
Absolute Extrema

Name________________________Pd.___
Day 5 Application of Derivatives

$f(x)=\dfrac{x}{x^2-x+1}$, [0,3]

$f'(x)=\dfrac{-x^2+1}{(x^2-x+1)^2}$

$f'(x)=0$ | $f'(x)$ DNE
$x=\pm 1$ | none

x	y
0	0
1	1
3	$\frac{3}{7}$

abs max of 1 at x=1

abs min of 0 at x=0

6. $f(t)=\sqrt[3]{t}\,(8-t)$, [0,8]

$=8t^{1/3}-t^{4/3}$

$f'(t)=\frac{8}{3}t^{-2/3}-\frac{4}{3}t^{1/3}$

$=\dfrac{8}{3t^{2/3}}-\dfrac{4t^{1/3}}{3}$

$=\dfrac{8-4t}{3t^{2/3}}$

$f'(t)=0$ | $f'(t)$ DNE
$t=2$ | $t=0$

t	y
0	0
2	7.5595
8	0

abs min of 0 at x=0, 8

abs max of 7.5595 at x=2

$f(t)=2\cos t+\sin 2t$, $\left[0,\frac{\pi}{2}\right]$

$f'(t)=-2\sin t+2\cos 2t$

$\sin t=\cos 2t$

$t=.5236$

x	y
0	2
.5236	2.598
$\frac{\pi}{2}$	0

abs min of 0 at $x=\frac{\pi}{2}$

abs max of 2.598 at x=.5236

8. $f(x)=xe^{-\frac{x^2}{8}}$, [−1,4]

$f'(x)=xe^{-x^2/8}\cdot\frac{-2x}{8}+e^{-x^2/8}$

$=\dfrac{-x^2e^{-x^2}}{4}+e^{-x^2/8}$

$=e^{-x^2/8}\left(-\frac{x^2}{4}+1\right)$

$-\frac{x^2}{4}+1=0$

$-x^2=-4$

$x=\pm 2$

x	y
−1	−.882
2	1.213
4	.541

abs min of −.882 at x=−1

abs max of 1.213 at x=2