Chapter 5 Applications of Derivatives

So, we have learned about derivatives and taken a bunch of them...now we get to use them for things!

Vocabulary:

Absolute Maximum  Absolute Minimum  same as Global Max and Global Min

Abs max is the highest value that the function takes on.
Abs min is the lowest value that the function takes on.
Sometimes these are referred to as Absolute Extrema.
Relative Extrema:

Your book talks about Local Extreme Values as:

- local max value: at $c$ iff $f(x) \leq f(c)$ for all values of $x$ in some open interval containing $c$

Here is what you need to know:

1. If $f$ is continuous on a closed interval $[a,b]$, the $f$ has both a maximum and minimum value on the interval.

2. If a function $f$ has a local or RELATIVE Max or RELATIVE Min value at an interior point $c$, then if $f'$ exists, $f'(c)=0$ or undefined...

   places where $f'(x)=0$ or is undefined are call CRITICAL POINTS
Finding Absolute extrema:

\[ f(x) = x^\frac{2}{3} \] on the interval \([-2, 3]\)

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

nothing makes \( f'(x) = 0 \)

However, \( f'(x) \) is undefined at \( x = 0 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( f(x) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>( \sqrt[3]{4} )</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>( \sqrt[3]{9} )</td>
</tr>
</tbody>
</table>

abs. max val of \( f(x) \) on \([-2, 3]\) is \( \sqrt[3]{4} \)

abs. min val of \( f(x) \) on \([-2, 3]\) is 0

1. find \( f'(x) \)
2. set \( f'(x) = 0 \) and solve
3. find where \( f'(x) \) is undefined

The answers to #2 and #3 are your critical points (c.p.)

4. make an \( x \mid f(x) \) table.
   Put the end pts and c.p. in the table.
5. analyze
AB Hwk # 31

5.1/1,2,5-8,12,15,18  use a calculator on 19,22,25

p188/81-83 all

ch 4 rev/ 38,40,48,53,59,63,64,66