On tomorrow’s quiz, I promise that I will NOT use First Derivative Test to show that \( f(x) \) is \textbf{INCREASING} or \textbf{DECREASING}.

Instead, First Derivative Test is used to justify \textbf{R E L A T I V E E X T R E M A}.

Furthermore, Second Derivative Test is not used to justify \textbf{C O N C A V I T Y}.

It is used to justify \textbf{R E L A T I V E E X T R E M A}.

If I do either one of these incorrect things, I will see a screeching on \textbf{NOI} my quiz paper.

1. For what value(s) of \( x \) is the function \( f(x) = x^3 - 9x^2 - 120x + 6 \) increasing? Justify

\[
\begin{align*}
\text{Sign of } f' & \quad + \quad - \quad + \\
\text{function inc} & \quad \text{dec} \quad \text{inc} \\
-4 & \quad 10 \\
\text{f(x) is increasing from } (-\infty, -4) \cup (10, \infty) \\
\text{because } f'(x) > 0
\end{align*}
\]

2. For what value(s) of \( x \) does the function \( f(x) = x^3 - 9x^2 - 120x + 6 \) have a local minimum? Justify.

\[
\text{local min at } x = 10 \text{ because of First Derivative Test} \\
(f'(x) \text{ changed from negative to positive})
\]

3. Where is \( f(x) = x^3 - 12x \) concave down? Justify.

\[
\begin{align*}
\text{sign of } f'' & \quad - \quad + \\
\text{concave down} & \quad \text{concave up} \\
& \quad 0 \quad 2 \\
\text{f(x) is concave down from } (-\infty, 0) \text{ because } f''(x) < 0
\end{align*}
\]

4. Find the coordinates of all relative extrema of \( f(x) = x^3 - 12x \). Justify each using a different method than you used in #2.

\[
\begin{align*}
\text{rel min at } (2, -16) \\
\text{rel max at } (-2, 16)
\end{align*}
\]

Due Thursday A.54 - p.216 #39, 41, 45, 47, 52, 55-60

Quiz Thursday on increasing/ decreasing intervals, CP’s, and absolute/relative extrema