Find the following for \( f(x) = x^3 - 3x^2 + 33 \) (if they exist; if they don’t exist, state so). Use this information to graph \( f \).

Note \( f'(x) = 3x^2 - 6x, \ f''(x) = 6x - 6, \ f(-2) = 13, \ f(-3) = -21 \)

[1.5] 1a.) critical numbers:  _________________

[1.5] 1b.) local maximum(s) occur at \( x = \) _________________

[1.5] 1c.) local minimum(s) occur at \( x = \) _________________

[1.5] 1d.) The global maximum of \( f \) on the interval \([0, 5]\) is ______ and occurs at \( x = \) _________________

[1.5] 1e.) The global minimum of \( f \) on the interval \([0, 5]\) is ______ and occurs at \( x = \) _________________

[1.5] 1f.) Inflection point(s) occur at \( x = \) _________________

[1.5] 1g.) \( f \) increasing on the intervals _________________

[1.5] 1h.) \( f \) decreasing on the intervals _________________

[1.5] 1i.) \( f \) is concave up on the intervals _________________

[1.5] 1j.) \( f \) is concave down on the intervals _________________

[1.5] 1k.) Equation(s) of vertical asymptote(s) _________________

[4] 1l.) Equation(s) of horizontal and/or slant asymptote(s) _________________

[4.5] 1m.) Graph \( f \)
\[ f(x) = x^3 - 3x^2 + 33 \]

\[ f'(x) = 3x^2 - 6x = 3x(x - 2) = 0 \text{ or DNE}, \text{ critical points: } x = 0, 2 \]

Check increasing/decreasing between critical points \((f'(x) = 0, \text{ DNE})\) and singleton points not in domain (where function could change between increasing/decreasing).

\[ f''(x) = 6x - 6 = 0 \text{ or DNE}, \text{ so possible inflection point: } x = 1 \]

Check concave up/down between possible inflection points \((f''(x) = 0, \text{ DNE})\) and singleton points not in domain (where function could change between concave up/down).