Math 151 Lab 7

Use Python to solve each problem.

1. Given $f(x) = 3x^6 - 16x^5 + 24x^4 - x^2 + 14$:
   a) Plot f on the domain $x \in [-2, 3]$. In a print command, indicate how many local extrema and how many inflection points there appear to be.
   b) Find $f'(x)$ and the approximate critical values (real values only). Plot f' in an appropriate window to determine the intervals where f is increasing and decreasing (If intervals are not clear from the graph, test numbers around the critical values to determine the sign of f').
   c) Find $f''(x)$ and the possible inflection values of f (real values only). Plot f'' using the same plot window as b) to determine the intervals where f is concave up and concave down (If intervals are not clear from the graph, test numbers around the critical values to determine the sign of f'').
   d) How many local extrema and inflection points actually exist? Plot f in a different domain and range to show ALL extrema and inflection points.
2. Given $f(x) = e^{-0.1x} \ln|x^2 - 1|$:
   a) Plot f on the window $x \in [-10, 10]$, $y \in [-10, 10]$. In a print command, indicate how many local extrema and how many inflection points there appear to be.
   b) Find f' and determine the approximate critical values. **NOTE:** the **solve** command does not work, so plot f' in a small range to determine guesses for the **nsolve** command. Based on the graphs of f and f', determine the intervals where f is increasing and decreasing.
   c) Find f'' and determine the appropriate possible inflection points. **NOTE**: use the same technique as done in part b). Based on the graphs of f and f'', determine the intervals where f is concave up and concave down.
   d) How many local extrema and inflection points actually exist? Plot f in three different domains (the domain of the function provides convenient choices) to show the three parts of the graph with ALL extrema and inflection points (make sure the graph goes far enough to see the concavity changes).

      (GENERAL NOTE: Python has issues with a function of the form $\ln|g(x)|$. Find the derivatives of f WITHOUT the absolute values inside the logarithm, then recopy your result and insert them before plotting and solving.)