Math 151 Lab 7

Use MATLAB to solve each problem.

Some of the commands you may need on this assignment are: syms, fplot, diff, simplify, solve, double, axis, subs, plot

1. Given $f(x) = \dfrac{x^3 + 5x^2 + 1}{x^4 + x^3 - x^2 + 2}$:
   a) Plot f on the domain $x \in [-10, 10]$. In a text or comment line, indicate how many local extrema and how many inflection points there appear to be.
   b) Find $f'(x)$ and the critical values of f (real values only).
   c) Plot f' in the window $x \in [-12, 10]$, $y \in [-10, 10]$ to determine the intervals where f is increasing and decreasing (indicate these in a text or comment line. If intervals are not clear from the graph, test numbers between the critical values to determine the sign of f').
   d) Find $f''(x)$ and the possible inflection values of f (real values only).
   e) Plot f'' using $y \in [-10, 10]$ (and an appropriate x domain) to determine the intervals where f is concave up and concave down (indicate these in a text or comment line. If intervals are not clear from the graph, test numbers between the critical values to determine the sign of f'').
   f) How many local extrema and inflection points actually exist? Plot f twice, each in a different domain to show ALL extrema and inflection points.
2. Repeat #1 using $g(x) = -2x^6 + 5x^5 + 140x^3 - 110x^2$ (but use domains of $x \in [-5, 5]$ instead)
3. Find a cubic function $f(x) = ax^3 + bx^2 + cx + d$ which has a local maximum value of 3 at $x = -2$ and a local minimum value of 0 at $x = 1$. Plot the function and the two points together in the interval $x \in [-3, 2]$.