Borough of Manhattan Community College

Derivatives and Curve Sketching

1. Let $f(x)=|x^2+3x+2|$. Graph f(x). Using the graphical evidence together with your conceptual knowledge of how f(x) should behave, answer the following questions, and explain your answers.
   a. for what values of x, if any, is f(x) not defined?
   b. for what values of x, if any, is f(x) not continuous?
   c. for what values of x, if any, is f(x) not differentiable?

2. Let $f(x)=\sqrt{x}$. Graph f(x) together with its tangent and normal lines at $x=\frac{1}{4}$.

3. Plot the curve $x^3+y^3=6xy$ together with the tangent to the curve at the point $(\frac{4}{3},\frac{8}{3})$.

4. Let $f(x)=3x^4-8x^3+6x^2-1$.
   a. Find all critical points. Classify each as either a relative minimum, a relative maximum, or neither.
   b. Determine the open intervals on which the function is increasing or decreasing.
   c. Find all inflection points
   d. Determine the open intervals on which the function is concave up or down.