Math 105 - Practice Exam #2

This Practice Exam and is NOT to be handed in. Attempt this exam multiple times until you feel prepared to take the Exam. Show as many steps as possible when simplifying and solving so that you get partial credit on the exam for work shown.

1. Take the derivative and stop. DO NOT SIMPLIFY!

   a. $H(x) = x^4 + \frac{2}{x^3} - \sqrt{x} + \pi$

   b. $f(x) = \left(4x^2 - 5x + \frac{1}{x}\right)^3$

   c. $g(t) = \sqrt[3]{7t^6 + 5t^2 + 8}$

   d. $h(x) = (4x^8 - x)(3x^3 + 2x + 1)$

   e. $f(x) = 3x(7x + 1)^5$

   f. $f(x) = \frac{3x - 1}{2x^2 - 5}$

2. Compute the derivative using implicit differentiation
   a. $4x + 8y = 3$

   b. $\frac{2}{x} + \frac{1}{y} = 6$

   c. $5x + x^2 y^3 = 2$

3. Compute **the second derivative** of the following function. SIMPLIFY COMPLETELY!

$f(x) = 7x + \frac{1}{x^2}$

4. For the function $f(x) = x^4 + 4x^3 + 4x^2$

   a. Find the **x and y intercepts** of the function if they exist. Answer as ordered pairs.

   b. Find the **equations of any vertical and horizontal asymptotes**, if they exist. You may use precalculus reasoning, or calculus techniques.

   c. Using calculus, identify **relative maxima and minima**, if they exist.

Recall, $f(x) = x^4 + 4x^3 + 4x^2$

d. Find the **inflection point(s),** if any, and the **intervals** where the function is concave up and concave down.

e. Sketch a fairly accurate graph of *f(x)* based on the information in parts a-d.

5. For the function $f(x) = \dfrac{1}{x^2 + x + 1}$

   a. Find the **x and y intercepts** of the function if they exist. Answer as ordered pairs.

   b. Find the **equations of any vertical and horizontal asymptotes**, if they exist. You may use precalculus reasoning, or calculus techniques.

   c. Using calculus, identify **relative maxima and minima**, if they exist.

Recall, $f(x) = \dfrac{1}{x^2 + x + 1}$

d. Find the **inflection point(s),** if any, and the **intervals** where the function is concave up and concave down.

e. Sketch a fairly accurate graph of *f(x)* based on the information in parts a-d.