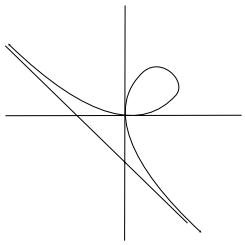
Honors Analysis Name _____

Copy original problem. Per _____ Date _____

Convince *me* that **you** understand the concept***!***

No decimal fractions.

Chapter 4 Mechanical Exam



I The curve on the right is called the *folium of Decartes* and has the equation: $x^3 + y^3 = 3xy$. The curve was originally proposed by Rene Decartes as a challenge to Pierre Fermat to find its tangent line.
The curve has as a tilted asymptote $y = -x - 1$. (25 pts)

a) Find that tangent line at $(\frac{2}{3}, \frac{4}{3})$. Write the equation of the line in *standard* form, ie. without fractions and equal to zero.

b) Find the coordinate where the tangent line in part (a) intersects with the asymptote.

II Given $f(x) = \dfrac{1}{1-x}$. (tot 30 pts)

a) Find the domain and range of $f(x)$.

b) Determine the *x*-intercept of the tangent line to $f(x)$ at $x = 3$.

c) Find the equation(s) of all tangent lines to $f(x)$ which are perpendicular to: $x + 4y - 2 = 0$

III Identify (and justify) the coordinates of all extreme values. $f(x) = (3x-2)^2(4-3x)^3$ for $x \in [-1, 2]$.

(20pts)

IV Given $f(x)$. Determine $f'(x)$. Do not simplify your answers. (for example, leave negative exponents as negative exponents, do not combine constants, etc.) Basically, I am looking for evidence that you have used the proper formula in the proper order at the proper time. (15 ps)

$$f(x) = \frac{(4x - 3\sqrt{x})^3 \sqrt{3x^2 + 2x + 1}}{3x^2 \sqrt{2x^2 - 3x + 1}}$$

V Newton's Method. Explain how "Newton's Method for finding roots" of equations works. Do *not* use specific examples. (You *are* allowed to use coordinates like $(x_1, f(x_1))$. Conclude your explanation with "Newton's recursion formula". (10 pts)

Extra Credit ---------- 5 pts ----------

Reconsider the folium of Decartes in section I. What is the shortest distance from the origin to the line tangent to the folium at $(\frac{2}{3}, \frac{4}{3})$?