

Honors Analysis

Name _____

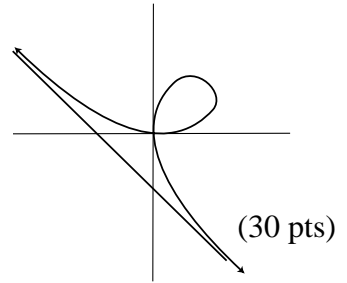
Copy original problem.

Per _____

Date _____

Convince *me* that **you** understand the concept!*No calculators.*

Chapter 4 Mechanical Exam

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

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

IIGiven $f(x) = \frac{x}{1-x}$. (hint: Be sure your responses are properly justified.)

(tot 30 pts)

- Find the domain and range of $f(x)$.
- Determine the x -intercept of the tangent line to $f(x)$ at $x = 3$.
- Find the equation(s) of all tangent lines to $f(x)$ which are perpendicular to: $x + 4y - 2 = 0$

IIIIdentify (and justify) the coordinates of **all** extreme points for the given function.

Use the phrase “absolute” or “local” as appropriate.

(20pts)

$$f(x) = \sin^2 x - \sin x \quad \text{for } 0 \leq x \leq \frac{3\pi}{2}.$$

IVGiven $f(x)$. 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. (20 ps)

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

Extra Credit ----- **5 pts** -----Reconsider the folium of Descartes in section I. What is the shortest distance from the origin to the line tangent to the folium at $(\frac{2}{3}, \frac{4}{3})$?