

Math 135, section F2, summer 2006

These problems are due at the beginning of class on Monday, July 24. I will grade them as if they were exam problems and you may earn as many as **40 points** towards your course grade. You must hand in work which is your own, but you may consult me (by e-mail, for example) or discuss the problems with each other, or consult any other useful resources (textbooks, calculators, etc.).

Note I prefer that answers which contain such numbers as $7 + 2\sqrt{3}$ be left “as is” and *not* approximated by a number like 10.464!

In problems 1–4 give explicit answers to the following questions:

FUNC The domain and range of the function as well as possible (you may need to look at the derivative to give a complete answer to this, of course); the limiting behavior as $x \rightarrow \pm\infty$; the limiting behavior as $x \rightarrow w^\pm$ if w is any number not in the domain of the function; any vertical or horizontal asymptotes.

FUNC' Critical points and critical numbers; types of these (such as [relative|absolute] [max|min]); largest intervals of [in|de]creasing behavior.

FUNC'' Inflection points and largest intervals where the graph is concave [up|down].

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

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

3. $f(x) = x + \sin x$.

4. $f(x) = \frac{2x^2+9}{x^2+x+3}$.

5. Suppose you know that $y = f(x)$ is a differentiable function, and that $y = 5x + 7$ is tangent to $y = f(x)$ when $x = 2$.

a) What is $f(2)$? What is $f'(2)$?

b) Suppose you additionally know that $f''(2) = 8$. If $x = 2.03$, then $y = 5(2.03) + 7 = 17.15$ (this came from formula for the line given above). Do you suspect that $f(2.03)$ is larger or smaller than 17.15? Explain your answer.