MATH 151–04,05,06 EXAM #1: October 14, 1998Name: ______________________

INSTRUCTIONS: Do all problems.

Show all your work. Full credit may not be given for an answer alone.

You may use a TI-82 calculator or equivalent.
You may not use a TI-92 or any calculator with a QWERTY keyboard.

(15) 1. Use the definition of derivative (as a limit) to find $f'(x)$ for the function $f(x) = \dfrac{4}{2x+5}$.

(15) 2. (a) Find all the points on the graph of the function $f(x) = 4x + \dfrac{5}{x+1}$ where the tangent line is horizontal.

(b) (4 pts) On the interval $0 \le x \le 2$, where is the graph steepest (positive or negative slope)? Explain your answer in terms of what you know about $f'(x)$.

(12) 3. (a) Find the equation of the line tangent to the curve $x^4 + 3xy^2 + y^3 = 11$ at the point $(-2, 1)$.

(b) If $y = x^5 \sin 4x$, find $\dfrac{dy}{dx}$.

(10) 4. Sketched below are the graphs of a function f and its derivative f'. Determine which is which and explain your answer by reference to specific points on the graph. Include in your answer an explanation why the other choice would definitely be wrong.

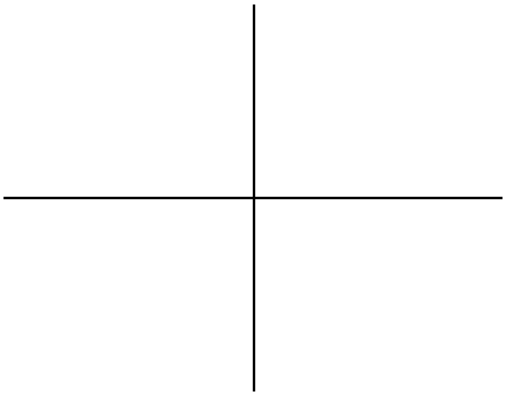

Fig. I

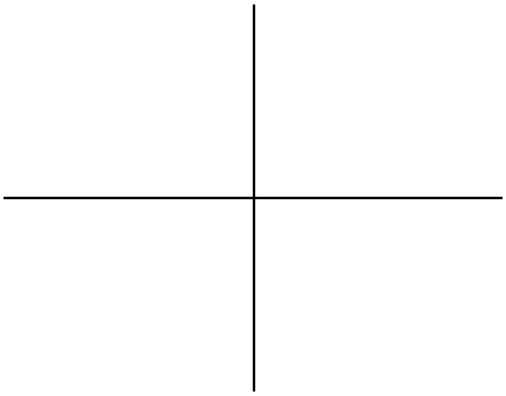

Fig. II

(12) 5. Sketch the graph of $y = \dfrac{2x-5}{x-2}$. Find at least one point P on the graph such that the line through P and $(2, -1)$ is tangent to the graph.

(16) 6. An object moving along a horizontal s-axis from time $t = 0$ to time $t = 100$. Its position function is $s = 80t - 5t^2$.

(a) At which moments is the object moving to the left? to the right?

(b) At which moments is the object moving to the right and slowing down?

(c) At which moments is the object moving to the left and slowing down?

(d) How far to the right does the object get?

(20) 7. Let $f(x) = \begin{cases} \dfrac{x^2-4}{x^2-5x+6}, & \text{if } x > 2,\ x \neq 3 \\ \dfrac{5\sin x}{x}, & \text{if } 0 < x \leq 2 \\ 5 + x, & \text{if } x \leq 0 \end{cases}$

(a) Find $\lim\limits_{x \to 2^+} f(x)$.

(b) Find $\lim\limits_{x \to 0^+} f(x)$.

(c) Find all the values of x at which f is not continuous, and explain in terms of the definition of continuity.

(d) (6 pts) Find all the vertical and horizontal asymptotes of f.