MATH 124 D
Exam I
April 27, 2010

Name _____

Student ID #_____   Section _____

HONOR STATEMENT

"I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam."

SIGNATURE:_____

1	12	
2	12	
3	10	
4	6	
5	10	
Total	50	

- Your exam should consist of this cover sheet, followed by five problems on six pages. Check that you have a complete exam.

- Show all work and justify your answers.

- Unless otherwise indicated, your answers should be exact values rather than decimal approximations. (For example, $\frac{\pi}{4}$ is an exact answer and is preferable to its decimal approximation 0.7854.)

- You may use a scientific calculator and one 8.5×11-inch sheet of handwritten notes. All other electronic devices (including graphing calculators) are forbidden.

- Turn your cell phone OFF and put it AWAY for the duration of the exam.

GOOD LUCK!

1. (12 points) Evaluate the following limits. Each answer should be either a number, ∞, $-\infty$, or "does not exist." If the limit does not exist, explain why.

   (a) $\lim\limits_{x \to 4} \dfrac{x - 2\sqrt{x}}{(x-3)(x-4)}$

   (b) $\lim\limits_{x \to 1^+} \dfrac{x - 10}{x(1-x)}$

   (c) Let $f(x) = \begin{cases} \frac{x^2 - 3x + 7}{4x^3 + 9} & \text{if } x \leq 2 \\[2mm] \frac{\frac{1}{x+1} - \frac{1}{3}}{2 - x} & \text{if } x > 2 \end{cases}$

       i. $\lim\limits_{x \to -\infty} f(x)$

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

2. (12 points) Use derivative rules to compute the derivative of each of the following functions. (You do not need to simplify your answers.)

(a) $s(t) = \dfrac{\tan t}{t + 7\sqrt{t^3}}$

(b) $y = e^{3x} \sin x$

(c) $f(x) = \left(\dfrac{3x - 1}{2x + 5}\right)^{100}$

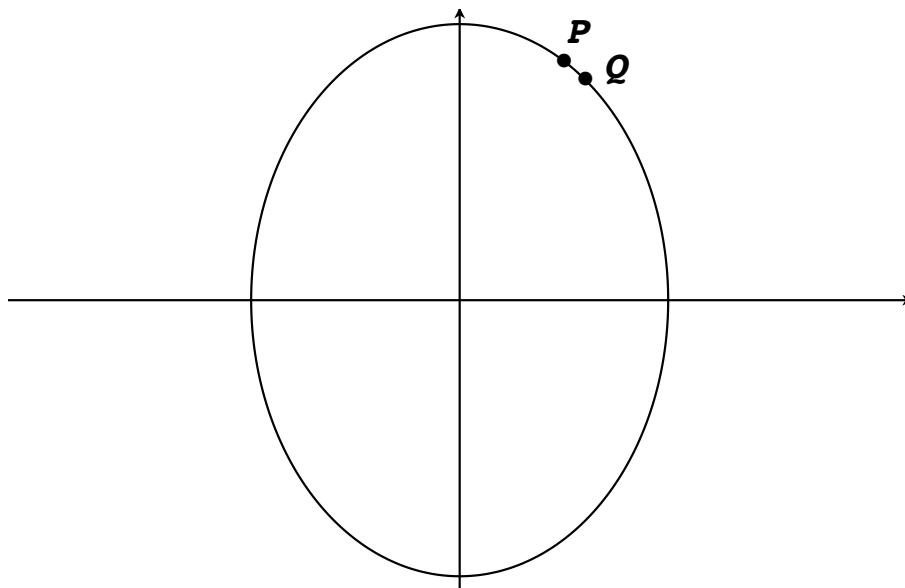(d) $g(\theta) = 5\sin(\theta) - \cos(\theta^2)$

3. (10 points) Let $f(x) = x^2 - 4x + 7$.

  (a) Find all values of x at which the tangent line to $f(x)$ is horizontal.

 (b) Find the equation of the line tangent to $f(x)$ at $x = 10$.

  (c) Find all values of a such that the line tangent to $f(x)$ at $(a, f(a))$ passes through the origin.

4. (6 points) The ellipse $25x^2 + 4y^2 = 100$ is pictured below. P and Q are points on this ellipse. The x-coordinate of P is 1. The x-coordinate of Q is $1 + h$.

Give an expression for $s(h)$, the slope of the secant line through P and Q. You do not need to simplify your expression.

5. (10 points) The graph of $f(x)$ is given below.

$y=f(x)$
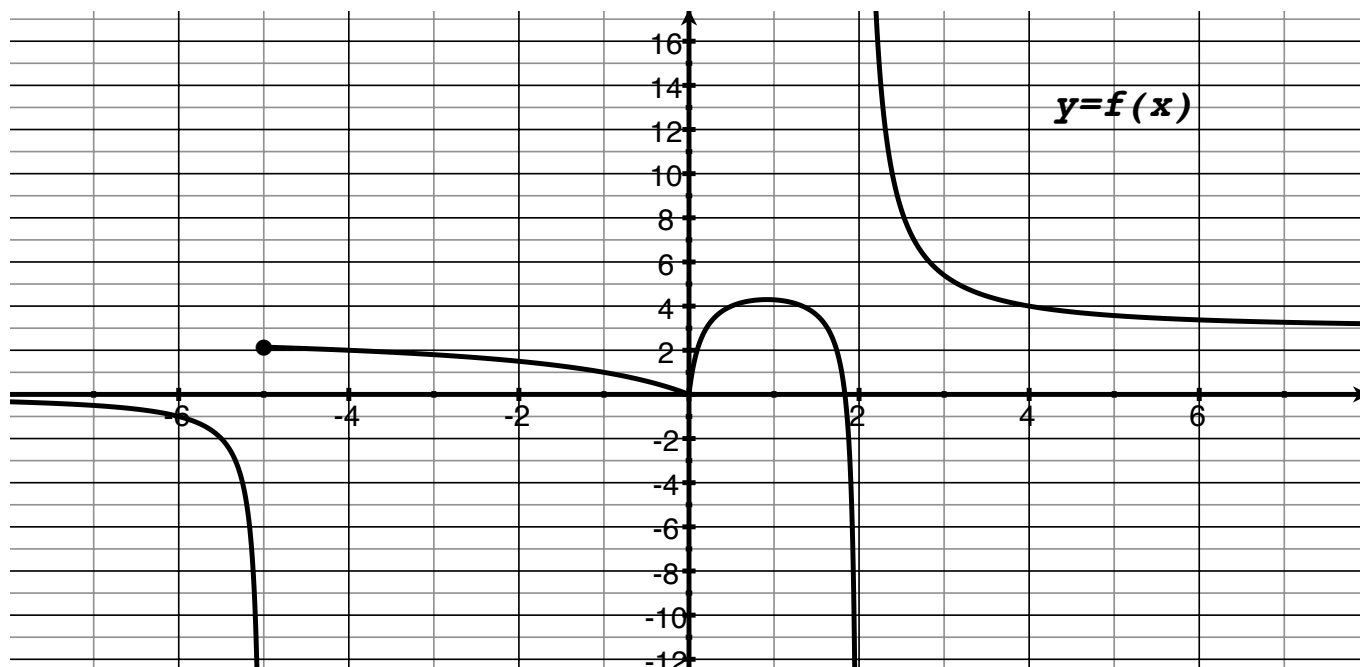
YOU DO NOT NEED TO JUSTIFY ANY OF YOUR ANSWERS FOR THIS PROBLEM.

(a) Give **the equations** of any horizontal asymptotes of $f(x)$.

(b) Give **the equations** of any vertical asymptotes of $f(x)$.

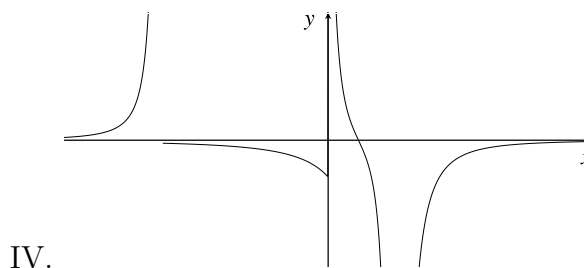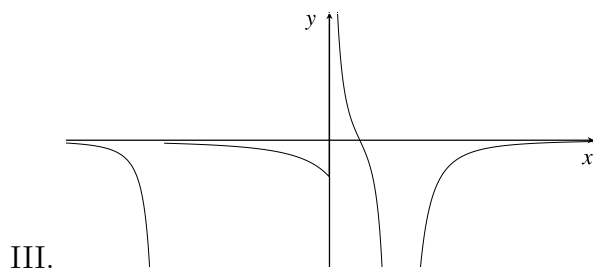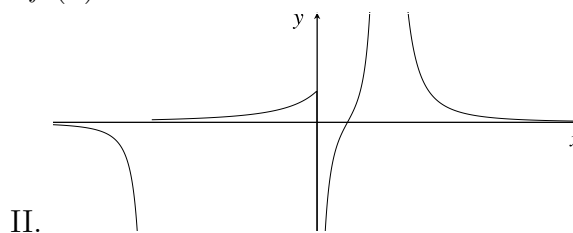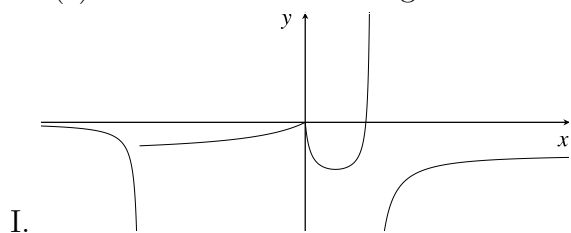(c) List all values of x at which $f(x)$ is discontinuous.

(d) List all values of x at which $f(x)$ is not differentiable.

THIS PROBLEM IS CONTINUED ON THE NEXT PAGE.

Here is the graph of $f(x)$ again.
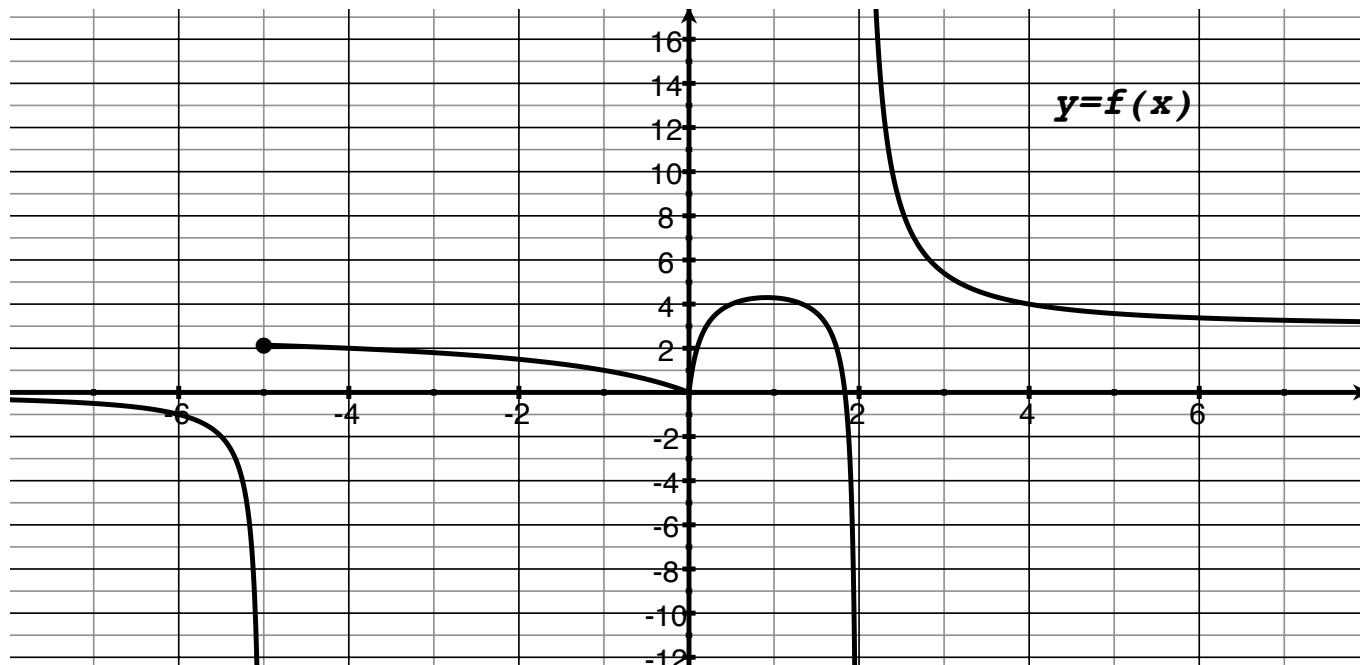
(e) Which of the following could be the graph of $f'(x)$?

I.

II.

III.

IV.

ANSWER: (circle one)   I   II   III   IV