

Math 124
Exam 1
April 25th, 2008

Name: _____

1. Your exam contains 5 questions and 5 pages; Please make sure you have a complete exam.
2. The entire exam is worth 100 points. Point values vary and these are indicated on each problem. You have 50 minutes for this exam.
3. Make sure to **ALWAYS SHOW YOUR WORK**; you will not receive any partial credit unless all work is clearly shown. If in doubt, ask for clarification. **Note:** To evaluate limits, proof by graph or table of values does not suffice for full credit.
4. If you need extra space, use the back of the exam and clearly indicate this.
5. You are allowed one 8.5×11 sheet of handwritten notes (both sides). Graphing and scientific calculators are allowed.
6. Leave answers in exact form (as simplified as possible) or round to 4 decimal places.
7. Put a box around your final answer where applicable.

Problem	Total Points	Score
1	32	
2	10	
3	22	
4	15	
5	21	
Total	100	

1. (32 pts.) Evaluate the following limits. **Justify** your answers. If the limit is infinite, determine if it is $+\infty$ or $-\infty$.

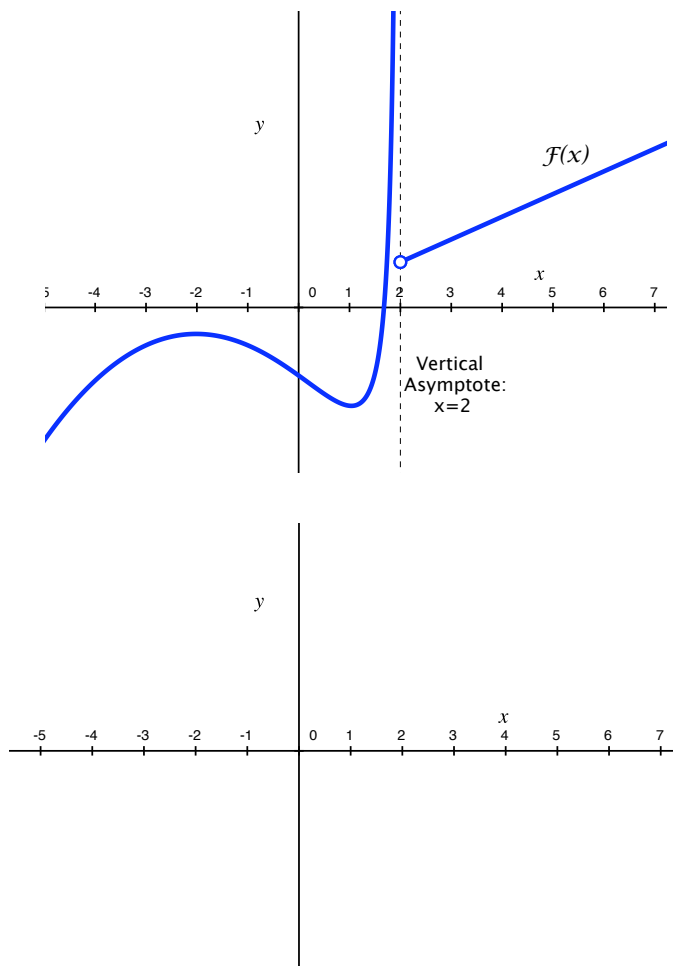
(a) (8 pts.) $\lim_{x \rightarrow 5} \frac{6x - 30}{x^2 - 7x + 10}$

(b) (8 pts.) $\lim_{x \rightarrow 2^-} \frac{6x - 30}{x^2 - 7x + 10}$

(c) (8 pts.) $\lim_{t \rightarrow -\infty} \frac{9t - \frac{3}{t}}{-4t + 8}$

(d) (8 pts.) $\lim_{t \rightarrow \pi/2} \frac{\cos^2 t - 3}{\sin t}$

2. (10 pts.) The graph of the function $F(x)$ is given below. Sketch the graph of the derivative $F'(x)$.



3. (22 pts.) $f(x) = \frac{5x^3}{x^5 - x^3} + 4 \arctan x$

- (a) (12 pts.) For what x -values is $f(x)$ **discontinuous**?

For each discontinuity, state the type of discontinuity: Removable (hole), jump, or infinite.

#3 Continued on the next page →

#3 Continued:

- (b) (10 pts.) Find the **equations** (if any) of the horizontal and vertical asymptotes of $f(x)$.

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4. (15 pts.) Suppose you drop a penny off the top of the Space Needle, which is illegal. The height (in feet) of the penny is given by $H(t) = -16t^2 + 520$ after t seconds.

Find the instantaneous **velocity** of the penny at $t = 4$ seconds **using limits**. Include **units** in your final answer.

5. (21 pts.) $g(x) = 5x + \sqrt{3x + 1}$

(a) (15 pts.) Find the derivative of $g(x)$ using the **limit definition** of a derivative.

(b) (6 pts.) Find an equation of the tangent line of $g(x)$ at $x = 0$.