

**Math 151**  
**Exam 1**  
**October 23rd, 2009**

Name: \_\_\_\_\_

1. Your exam contains 6 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. Put a 

box around your final answer
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 where applicable.
5. Leave answers in exact form (as simplified as possible).
6. You are allowed one 4" × 6" notecard (both sides).
7. To calculate derivatives, you may use the rules (shortcuts) from sections 3.1 and 3.2 **unless** otherwise indicated.
8. If you need extra space, use the back of the exam and clearly indicate this.

Problem	Total Points	Score
1	30	
2	8	
3	15	
4	9	
5	23	
6	15	
Total	100	

1. (30 pts.) Evaluate the following limits. **Justify** and give **exact** values for your answers.  
If the limit is infinite, indicate whether it is  $+\infty$  or  $-\infty$ .

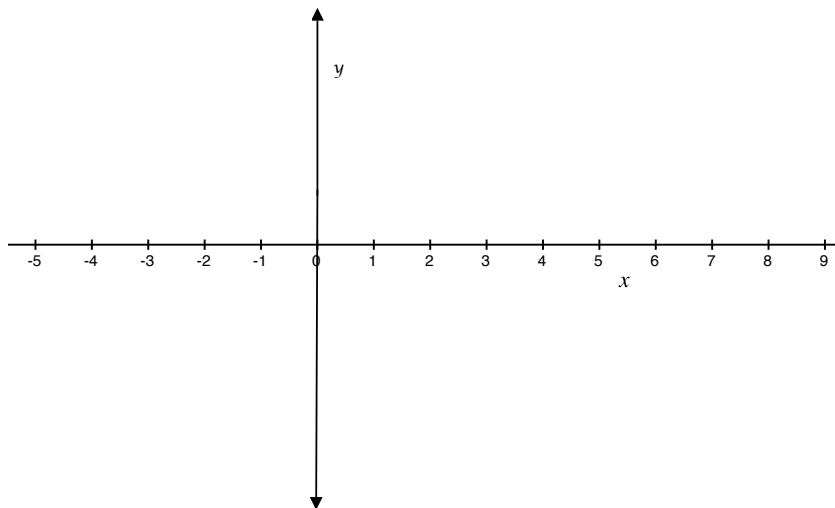
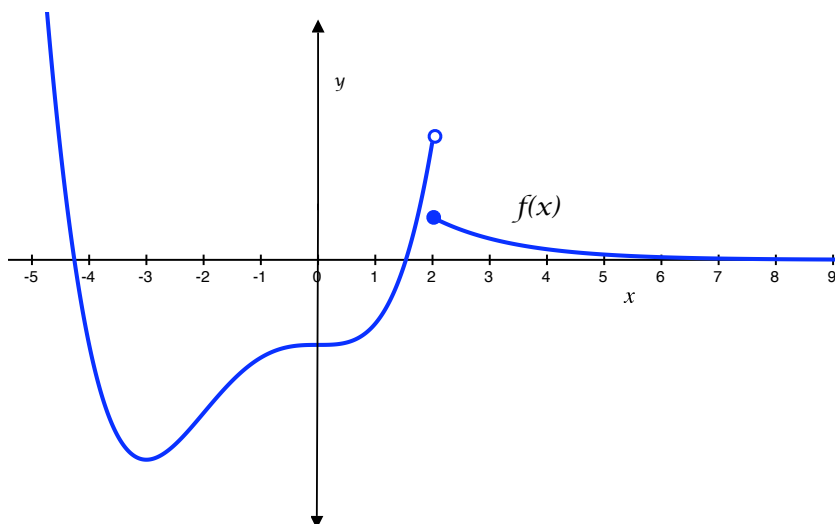
(a) (8 pts.)  $\lim_{t \rightarrow 2^-} \frac{3t-6}{t^2-4t+4}$

(b) (8 pts.)  $\lim_{x \rightarrow -\infty} \frac{-3x^5-x^3+1}{9x^5+2x^2-x}$

(c) (8 pts.)  $\lim_{x \rightarrow 3} \arcsin\left(\frac{x-3}{2x-6}\right)$

(d) (6 pts.)  $\lim_{r \rightarrow -3^+} \frac{e^r}{2r+2}$

2. (8 pts.) For the following function  $f$ , sketch a graph of the derivative  $f'$  on the axis given below.



3. (15 pts.) Find an **equation** of the line that satisfies two conditions:

- The line is tangent to the curve  $y = 16x^4 - 2x + 3$ .
- The line is parallel to  $y = 6x + 1$ .

4. (9 pts.) For  $y = 4\sqrt{t} \cdot e^t + \pi t$ ,  $\frac{dy}{dt} = ?$

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5. (23 pts.)  $h(x) = \begin{cases} \frac{3}{x^2} - 2 & \text{if } x \leq -1 \\ -\frac{1}{2}x^4 + 4x & \text{if } x > -1 \end{cases}$

(a) (5 pts.) Find the values of  $x$  at which  $h$  is discontinuous.

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

(b) (6 pts.) Find the **equations** of the horizontal and vertical asymptotes (if any) of  $h(x)$ .

#5 Continued on the next page  $\rightarrow$

#5 Continued:

(c) (3 pts.) Is  $h(x)$  differentiable at  $x = -1$ ? Justify your answer.

(d) (9 pts.) Find the derivative function  $h'(x)$ .

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6. (15 pts.) Find the derivative of  $g(x) = 3x^2 + \frac{1}{x}$  using the **limit definition** of a derivative.