

**Math 124**  
**Exam 1**  
**April 25th, 2007**

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

1. Your exam contains 5 questions and 6 pages; Please make sure you have a complete exam.
2. The entire exam is worth 100 points. Point values for problems vary and these are clearly indicated. 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 an extra sheet attached to the back of the exam and clearly indicate this.
5. You are allowed one  $8.5 \times 11$  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.

Problem	Total Points	Score
1	25	
2	15	
3	20	
4	20	
5	20	
Total	100	

1. (25 pts.) Evaluate the following limits. Justify your answers.

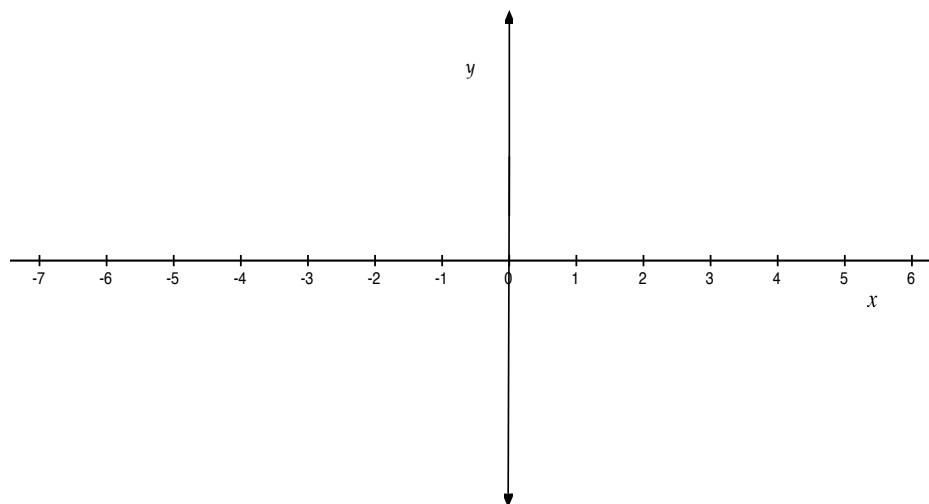
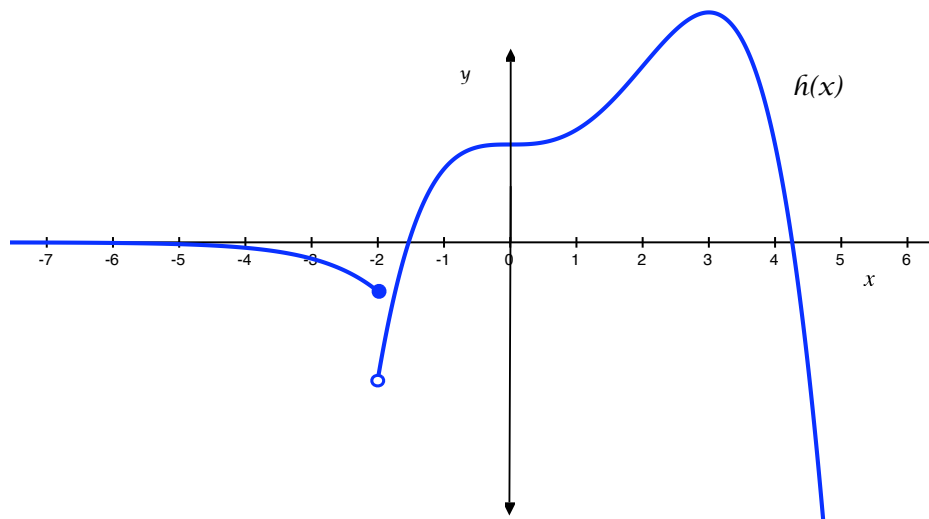
(a) (6 pts.)  $\lim_{x \rightarrow 3^+} \frac{2x-6}{x^2-6x+9}$

(b) (6 pts.)  $\lim_{z \rightarrow 2^+} \frac{|4-z^2|}{4-z^2}$

(c) (6 pts.)  $\lim_{t \rightarrow -\infty} \frac{2t^4+3t^3-1}{-4t^4-2t^2+t}$

(d) (7 pts.)  $\lim_{s \rightarrow \pi} \ln(\sin(s + \frac{\pi}{2}) + \frac{2\pi}{s})$

2. (15 pts.) For the following function  $h$ , sketch a graph of the derivative  $h'$  on the axis given below.



3. (20 pts.)

$$g(x) = \begin{cases} \frac{4x^2+12x}{x^2+2x-3} & \text{if } x < -1 \\ 2x^2 & \text{if } -1 \leq x \leq 1 \\ e^{-x} - 1 & \text{if } x > 1 \end{cases}$$

(a) (6 pts.) Find the numbers at which  $g$  is discontinuous.

(b) (6 pts.) Evaluate  $\lim_{x \rightarrow 0} g(x)$ .

(c) (8 pts.) Find the horizontal and vertical asymptotes (if any) for the function  $g$ .

4. (20 pts.) Suppose the distance (in feet) of my pet turtle Sam from a certain point is given by the equation  $s = 2 + \sqrt{t+1}$  at time  $t$  (in hours). What is Sam's instantaneous velocity at 3 hours? (Use limits to evaluate and include units for the velocity.)

5. (20 pts.) Find the derivative of  $f(x) = \frac{2}{x} + x^2$  using limits.

6. **Extra Credit** (5 pts.) Evaluate  $\lim_{x \rightarrow 1} \frac{\sqrt{x-1}}{\sqrt[3]{x-1}}$ . Justify your answer.