

MATH 1300: Calculus I, Spring 2008
MIDTERM EXAM 1

February 6, 2008

YOUR NAME:

Circle Your CORRECT Section

- | | |
|--|------------------------------------|
| 001 N. FLORES(8AM) | 009 R. KRIEGER (2PM) |
| 002 A. ANGEL (9AM) | 011 R. GROVER(10AM) |
| 003 D. ERNST (9AM) | 012 I. MISHEV (12PM) |
| 004 M. FORMICHELLA (10AM) | 013 R. CHESTNUT (1PM) |
| 005 I. BECKER(11AM) | 014 I. BECKER (1PM) |
| 006 D. VERNEREY (11AM) | 015 D. MCCARL (3PM) |
| 007 J. HARPER (12PM) | 017 N. FLORES (10AM) |
| 008 L. HARRIS (2PM) | |

*After you get the test back, if you consider that something was incorrectly graded,
DO NOT WRITE ON YOUR TEST!
As clearly as possible write down your version of the story on a clean sheet of paper,
attach it to your test, and give it back to your instructor for further consideration.*

problem	points	score
1	12 pts	
2	21 pts	
3	12 pts	
4	12 pts	
5	20 pts	
6	5 pts	
7	6 pts	
8	6 pts	
9	6 pts	
TOTAL	100 pts	

"On my honor, as a University of Colorado at Boulder student, I have neither given nor received
unauthorized assistance on this work."

SIGNATURE:

1. (4 points each) Match each function with the correct graph. (Note that there are more graphs than functions.)

(a) $g(x) = \frac{x^2 + 2x + 1}{(x - 2)(x + 1)}$

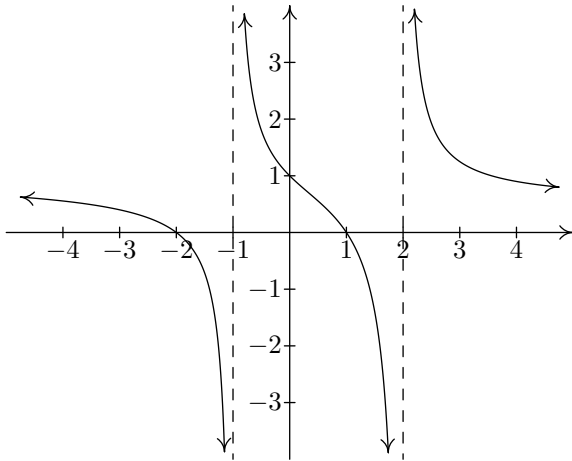
Graph: _____

(b) $f(x) = \frac{x^2 + x - 2}{(x - 2)(x + 1)}$

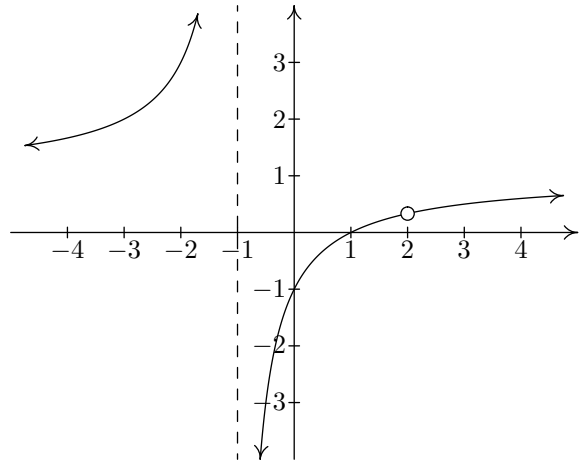
Graph: _____

(c) $h(x) = \frac{3x^2 - 3x - 6}{(x - 2)(x + 1)}$

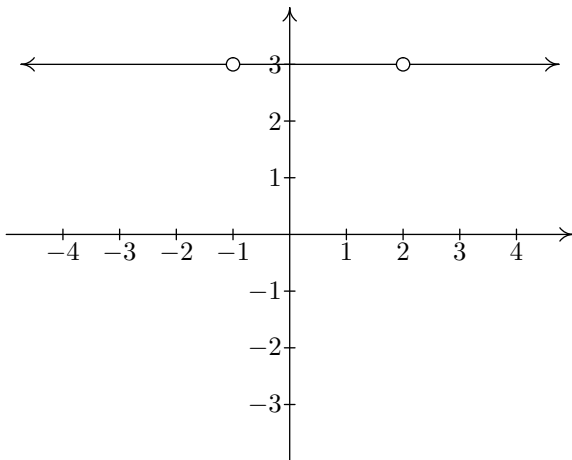
Graph: _____



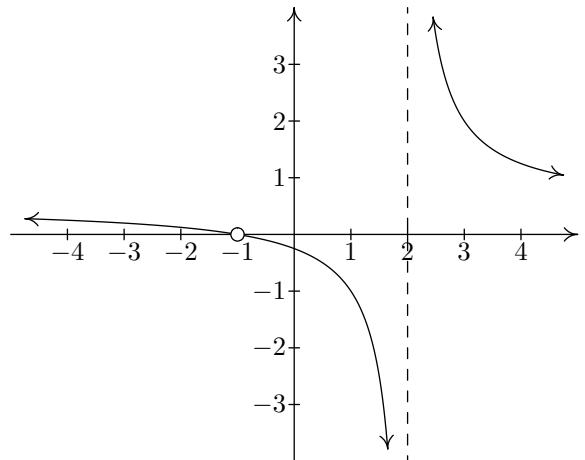
Graph A



Graph B

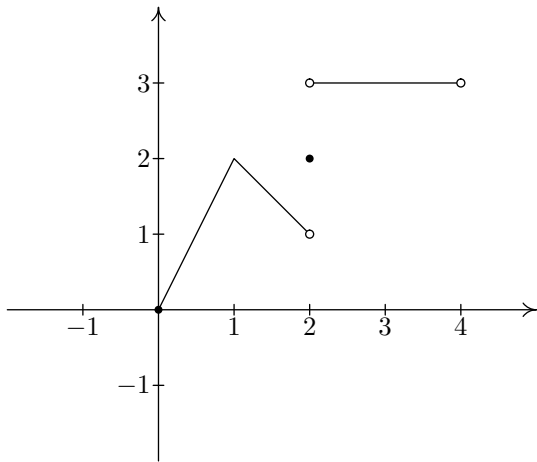


Graph C

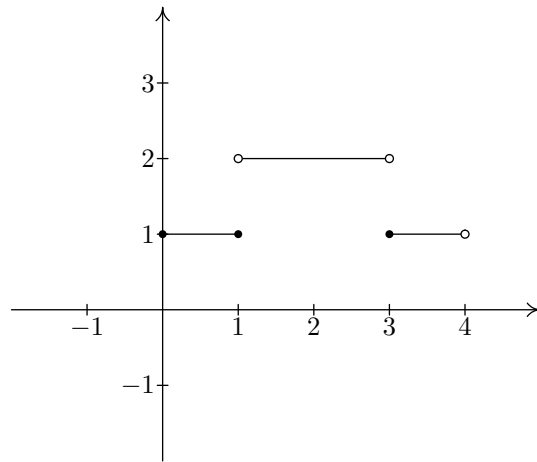


Graph D

2. (3 points each) Using the graphs below, evaluate each of the following expressions or answer the question. When you answer the two questions, (d) and (g) below, state your reasoning.



Graph of f



Graph of g

(a) $f(1/2)$

(b) $\lim_{x \rightarrow 2^+} f(x)$

(c) $\lim_{x \rightarrow 1} f(x)$

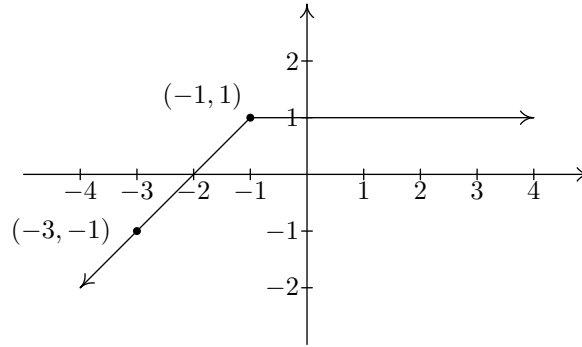
(d) Is $f(x)$ continuous at $x = 1$? Explain your answer.

(e) $\lim_{x \rightarrow 3} g(x)$

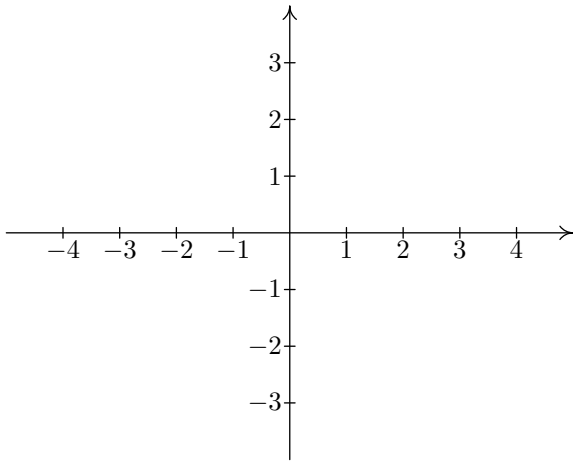
(f) $g(f(2.5))$

(g) Does $g(x)$ have an inverse function? Explain your answer.

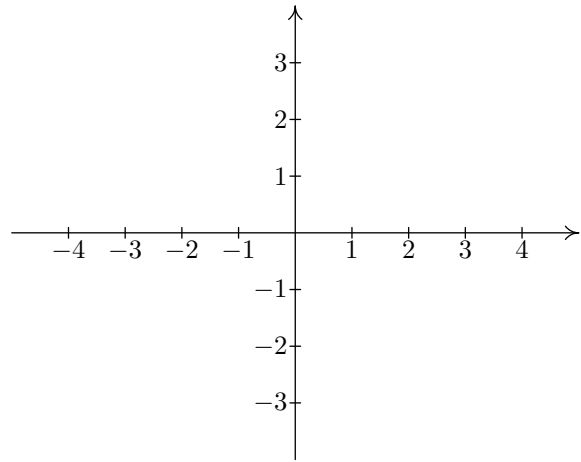
3. (3 points each) Suppose the graph of $f(x)$ looks like:



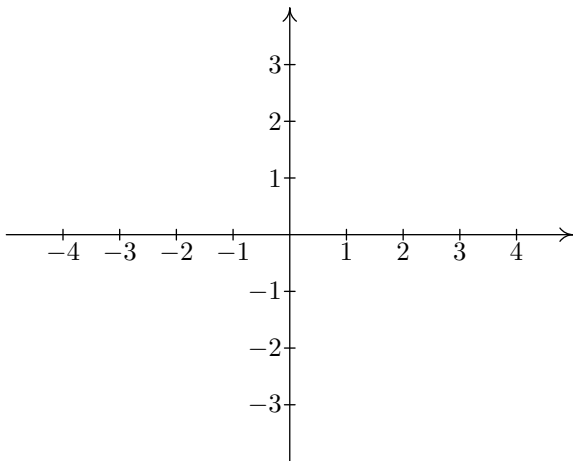
Using the axes provided, sketch the graph of each function.



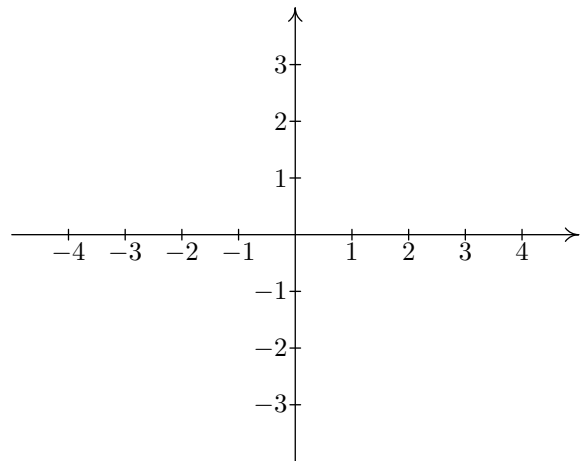
Graph of $y = f(x + 1)$



Graph of $y = 2f(x)$



Graph of $y = f(x) + 1$



Graph of $y = f(2x)$

4. (4 points each) For each of the following, find ALL values of x which satisfy the given equation.

(a) $\log_2(x + 1) - \log_2(x) = 1$

(b) $4^x - 7(2^x) - 8 = 0$ (Hint: $4^x = 2^{2x}$)

(c) $2 \sin(x) - 1 = 0$

5. (4 points each) Evaluate each of the following limits. If a limit does not exist, specify whether the limit equals ∞ , $-\infty$, or simply does not exist (in which case, write DNE). Sufficient work must be shown.

(a) $\lim_{x \rightarrow \infty} \frac{6 - x^2}{2x^2 + 6}$

(b) $\lim_{x \rightarrow 4} \frac{x - 4}{\sqrt{x} - 2}$

(c) $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\cos^2 x}{1 - \sin(x)}$

(d) $\lim_{t \rightarrow 1^-} \frac{1}{1 - t}$

(e) $\lim_{t \rightarrow 0} \frac{\sin(3t)}{2t}$

6. (5 points) Use the Squeezing Theorem to evaluate the following limit. Sufficient work must be shown.

$$\lim_{x \rightarrow \infty} \frac{1}{x} \cos(x)$$

7. (6 points) Using the limit definition of the slope of the tangent line (which is denoted m_{tan} in the book), find the *slope* of the tangent line to $y = x^2 + 2$, at the point where $x = 2$.

8. (3 points each) A 20 foot ladder is leaning against a wall with its base 2 feet from the wall. The bottom of the ladder begins to slide away from the wall at 2 feet per second.

(a) After how many seconds is the angle that the base of the ladder makes with the ground equal to $60^\circ = \pi/3$?

(b) After how many seconds does the top of the ladder reach the ground?

9. (3 points each) Let f be function that has an inverse, denoted by f^{-1} . Use facts about inverse functions to answer the following questions.
- (a) Suppose that $f(2) = 3$ and $f(4) = 6$. Find the equation of the secant line (also called chord) to the graph of f^{-1} through the pair of points whose x -coordinates are $x = 3$ and $x = 6$.

(b) Explain why the graph of f and the graph of f^{-1} are symmetric about the line $y = x$.