

Math 141

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Fall 2013

Name:

Student ID (last 6 digits): XXX-

TA recitation (check one):

Brian Allen: Anthony Zamberlan:
Lindsey Fox (2:10): Lindsey Fox (3:40):

MIDTERM 1

You have 50 minutes to complete the exam. Do all work on this exam, i.e., on the page of the respective assignment. Indicate clearly, when you continue your solution on the back of the page or another part of the exam.

Write your name and the last six digits of your student ID number on the top of this page. Check that no pages of your exam are missing. This exam has 6 questions and 8 printed pages (including this one and a page for scratch work in the end).

No books, notes or calculators are allowed on this exam!

Show all work! (Unless I say otherwise.) Correct answers without work will receive **zero**. Also, **points will be taken from messy solutions**.

Good luck!

Question	Max. Points	Score
1	15	
2	26	
3	15	
4	14	
5	15	
6	15	
Total	100	

1) [15 points] Draw the graph of a function $y = f(x)$ such that:

(i) $\lim_{x \rightarrow -2} f(x) = 1$

(ii) $\lim_{x \rightarrow 0} f(x) = -\infty$

(iii) $\lim_{x \rightarrow 2^-} f(x) = 0$

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

(v) $f(2) = 1$ [this is not a limit]

(vi) $\lim_{x \rightarrow \infty} f(x) = 1$

2) Compute the following limits.

(a) [6 points] $\lim_{x \rightarrow 2} \frac{x^2 - 4x + 4}{x^2 - 4}$

(b) [7 points] $\lim_{x \rightarrow 2} \frac{\sqrt{x-1} - 1}{x-2}$

(c) [6 points] $\lim_{x \rightarrow \infty} \frac{\sqrt{9x^4 + x^2 + 1}}{x - 2x^2}$

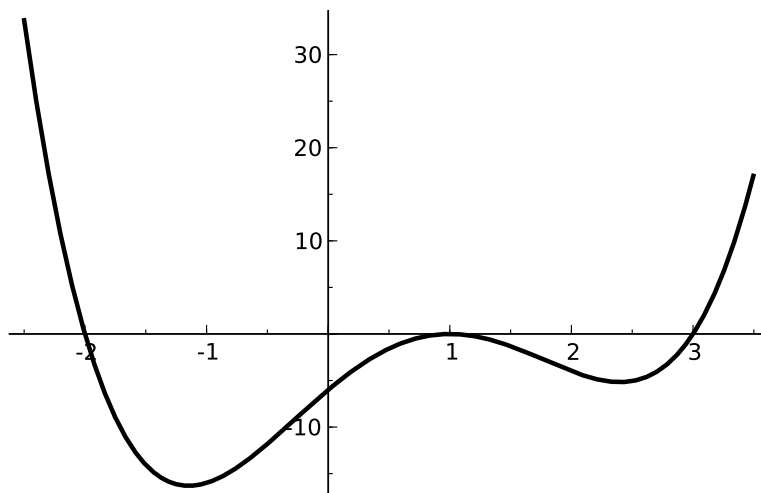
(d) [7 points] $\lim_{x \rightarrow 0} \frac{\sin(3x) \cos(4x)}{2x}$

3) [15 points] Compute the derivative of $f(x) = x + \frac{1}{x}$ using limits. [You *cannot* use formulas. You can check your result with the formulas, though.]

4) [14 points] Give the equation of the line tangent to the graph of $f(x) = 2\sqrt{x} - \frac{3}{x}$ at $x = 1$.

5) [15 points] Give a [finite] closed interval in which we have a solution to $2^x + 3^x = 4^x$.
[Justify!]

6) [15 points] The graph of $f(x)$ is given below.



Answer the following questions about the values of the *derivative* of $f(x)$. **No need to justify these.**

- (a) Fill the table below with +, −, or 0 if the corresponding value is positive, negative, or zero respectively.

value:	$f'(-2)$	$f'(0)$	$f'(1)$	$f'(2)$	$f'(3)$
sign:					

- (b) Which is larger, $f'(-2)$ or $f'(2)$? [If they are equal, just say so.]

Scratch: