February 22nd, 2012

Math 141

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Spring 2012

Name: .....

Student ID (last 6 digits): XXX- .....

TA recitation (check one):

Chelsea McAmis: ☐ Joshua Mike: ☐
Tim Krumwiede (11:15): ☐ Tim Krumwiede (12:40): ☐

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 7 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	25	
2	10	
3	15	
4	10	
5	10	
6	15	
7	15	
Total	100	

1) Compute the following limits.

(a) [5 points] $\lim_{x \to 3} \dfrac{x^3 - 9x}{x - 3}$

(b) [5 points] $\lim_{x \to 1} \dfrac{\left(\dfrac{1}{1 - x}\right)}{x - 1}$

(c) [5 points] $\lim_{x \to -\infty} \dfrac{2x^2 - \sqrt{x}}{x^2 + 3x^{-1}}$

(d) [10 points] $\lim_{x \to 0} \dfrac{\tan(4x)}{9x}$

2) [10 points] Compute $\dfrac{\mathrm{d}}{\mathrm{d}x}(\sqrt{x^3} \cdot \mathrm{e}^x)$.

3) [15 points] Find the equation of the line tangent to the graph of $f(x) = \dfrac{x+1}{x^2+1}$ at $x = 0$.

4) [10 points] Let

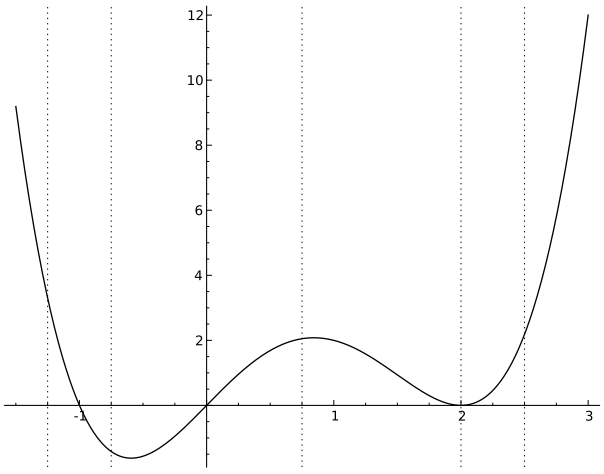
$$f(x) = \begin{cases} x^3 + 1, & \text{if } x < 0, \\ 1 - x^3, & \text{if } x \geq 0. \end{cases}$$

Is $f(x)$ continuous at $x = 0$?

5) [10 points] Write the limit definition of the derivative of $f(x) = \sin(x^2) - x$. **Do *not* compute the limit!** You just need to set it up.

6) [15 points] Show that the graphs of $f(x) = x\mathrm{e}^x$ and $g(x) = \cos(x)$ intersect and specify an interval in the x-axis for which we have at least one intersection.
[**Hint:** Use the *Intermediate Value Theorem*.]

7) [15 points] The graph of $f(x)$ is given below.



Put the following values of the derivative in non-decreasing order: $f'(-1.25)$, $f'(-0.75)$, $f'(0.75)$, $f'(2)$, $f'(2.5)$. [You do *not* need to show work on this one.]
[**Note:** To put -1, -2, 0, 3, 0, 1.25 in non-decreasing order, is to put them in the order: -2, -1, 0, 0, 1.25, 3. In other words, it is in increasing order, except consecutive numbers might be equal.]
[**Hint:** What is the *geometrical* interpretation of the derivative?]

Scratch: