Math 1300, Midterm 1

February 6, 2017

PRINT YOUR NAME: _____

PRINT INSTRUCTOR'S NAME: _____

Mark your section/instructor:

☐	Section 001	Brendt Gerics	8:00 - 8:50
☐	Section 002	Leo Herr	9:00 - 9:50
☐	Section 003	Tyler Schrock	9:00 - 9:50
☐	Section 004	Lee Roberson	10:00 - 10:50
☐	Section 005	Braden Balentine	10:00 - 10:50
☐	Section 006	Xingzhou Yang	10:00 - 10:50
☐	Section 007	Lee Roberson	11:00 - 11:50
☐	Section 008	Shen Lu	11:00 - 11:50
☐	Section 009	Suzanne Craig	12:00 - 12:50
☐	Section 010	Carlos Pinilla-Suarez	12:00 - 12:50
☐	Section 011	Nathan Davidoff	1:00 - 1:50
☐	Section 012	Sion Ledbetter	1:00 - 1:50
☐	Section 013	Ruofan Li	2:00 - 2:50
☐	Section 014	Daniel Martin	2:00 - 2:50
☐	Section 015	Isabel Corona	3:00 - 3:50
☐	Section 016	Ira Becker	3:00 - 3:50
☐	Section 017	Ira Becker	4:00 - 4:50

Question	Points	Score
1	9	
2	18	
3	11	
4	12	
5	8	
6	8	
7	12	
8	10	
9	12	
Total:	100	

- No calculators or cell phones or other electronic devices allowed at any time.
- Show all your reasoning and work for full credit, except where otherwise indicated. Use full mathematical or English sentences.
- You have 90 minutes and the exam is 100 points.
- You do not need to simplify numerical expressions. For example leave fractions like $100/7$ or expressions like $\ln(3)/2$ as is.
- When done, give your exam to your instructor, who will mark your name off on a photo roster.
- We hope you show us your best work!

1. The position, $s(t)$, of a banana slug from the end of a log is checked at various times t. The collected information is given in the table below.

t (in minutes)	10	20	60	110	300
$s(t)$ (in feet)	3.25	2.60	1.00	0.25	0.22

(a) (3 points) Find the slope of the secant line intersecting $s(t)$ at $t = 10$ and $t = 110$.

(b) (3 points) Estimate $s'(20)$.

(c) (3 points) Suppose $s'(50) = -0.3$. What does the value -0.3 represent in the context of the problem? Include units.

2. Determine the value of the following limits. You do NOT need to show work.

(a) (3 points) $\lim_{x \to 0} \dfrac{x-1}{\cos x}$

I) -1 II) 0 III) 1 IV) ∞ V) DNE

(b) (3 points) $\lim_{x \to \infty} \dfrac{5-x^2}{x+1}$

I) $-\infty$ II) -1 III) 0 IV) 1 V) ∞

(c) (3 points) $\lim_{x \to \frac{7}{2}} \dfrac{4x^2-49}{2x-7}$

I) 0 II) $\dfrac{7}{2}$ III) 14 IV) ∞ V) DNE

(d) (3 points) $\lim_{x \to 9} \dfrac{6 - x}{(9 - x)^2}$

I) $-\infty$ II) 0 III) 6 IV) 15 V) ∞

(e) (3 points) $\lim_{x \to -3^-} \dfrac{|x + 3|}{x + 3}$

I) -3 II) -1 III) 0 IV) 1 V) DNE

(f) (3 points) $\lim_{x \to 5} \dfrac{\sqrt{x + 4} - 3}{x - 5}$

I) 0 II) $\dfrac{1}{12}$ III) $\dfrac{1}{6}$ IV) ∞ V) DNE

3. (a) (2 points) State the mathematical definition of what it means for the function $f(x)$ to be continuous at $x = a$.

(b) (9 points) Find the value of k such that the following function is continuous.

$$g(x) = \begin{cases} x + k, & \text{if } x \geq 2 \\ kx^2, & \text{if } x < 2 \end{cases}$$

4. The following statements are all false. Justify why each statement is false by providing an explanation that includes a picture.

(a) (4 points) If $\lim_{x \to 8^+} f(x) = 51 = \lim_{x \to 8^-} f(x)$, then $f(x)$ is continuous at $x = 8$.

(b) (4 points) If $\lim_{x \to -4} r(x)$ does not exists, then $r(-4)$ does not exist.

(c) (4 points) If $f(x) = \dfrac{x^2 - 1}{x + 1}$ and $g(x) = x - 1$, then $f(x)$ is equal to $g(x)$.

5. (8 points) Use the Squeeze Theorem to determine

$$\lim_{x \to 5} |x - 5| \cos\left(\frac{2}{x - 5}\right).$$

6. (8 points) Let $f(x) = x^5 + 2x^3 + 2x^2 - 2$. Use the Intermediate Value Theorem to show $f(x)$ crosses the x-axis in the interval $[-1, 1]$. You must check that the hypotheses of the Intermediate Value Theorem are satisfied to receive full credit.

7. Consider the function $f(x) = \dfrac{3}{x+2}$.

(a) (9 points) Use the limit definition of the derivative to find $f'(1)$.

(b) (3 points) Write the equation of the tangent line of the function at $x = 1$.

8. (10 points) Draw a function which meets the following requirements:

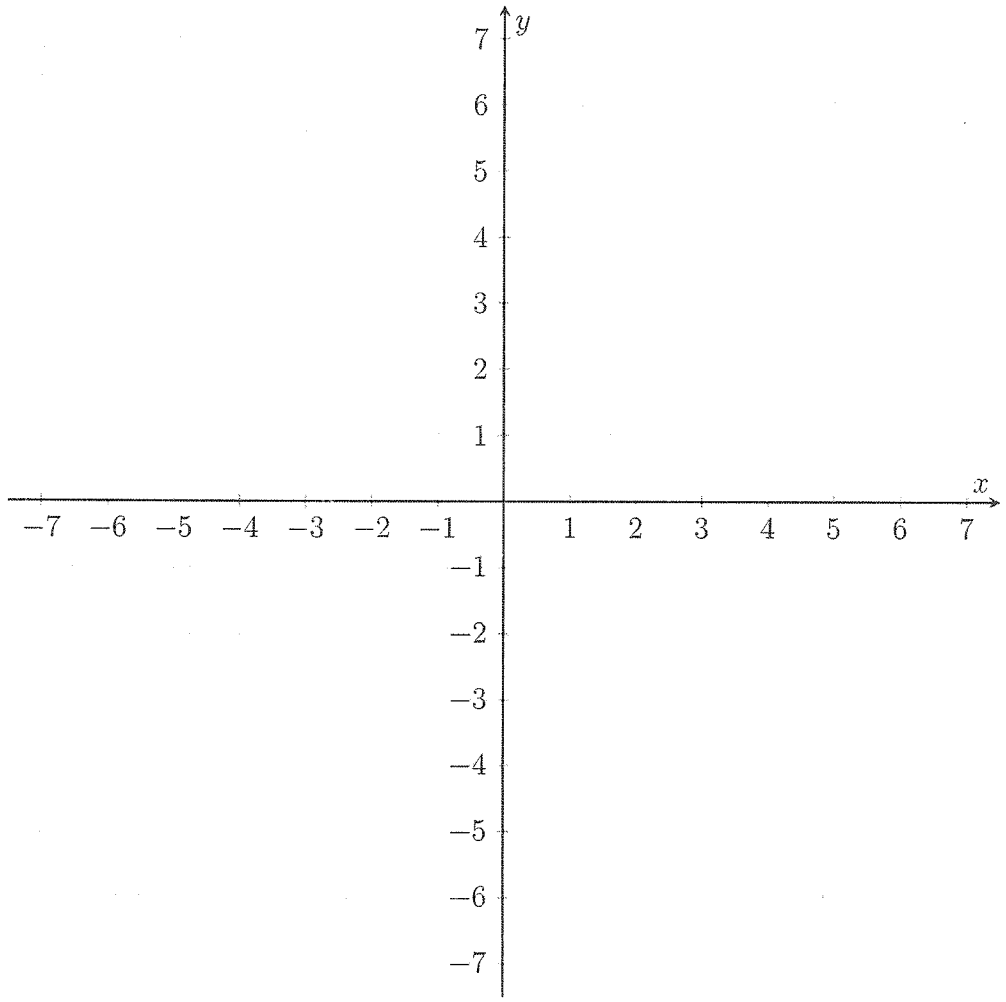
(a) $\lim_{x \to -\infty} f(x) = 2$

(b) $\lim_{x \to -4} f(x) = -\infty$

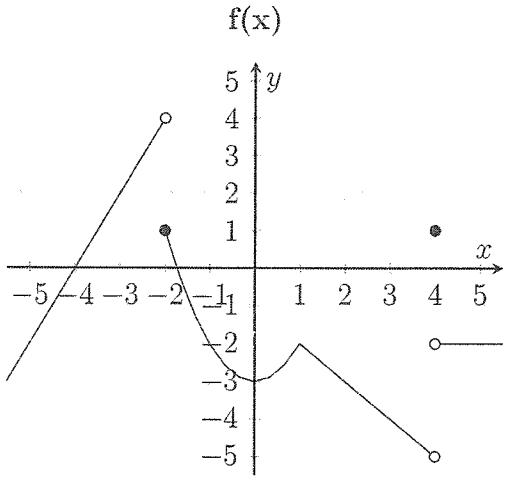
(c) $\lim_{x \to -1} f(x) = -3$

(d) $\lim_{x \to 2^+} f(x) = 3$

(e) $\lim_{x \to 5} f(x)$ DNE



9. Answer the questions about the following functions. You do NOT need to show work.



$$g(x) = \begin{cases} -x^2 + 1 & x \leq -3 \\ x + 1 & x > -3 \end{cases}$$

(a) (3 points) $\dfrac{f(4)}{g(4)}$

I) $\dfrac{-4}{15}$ II) $\dfrac{-2}{5}$ III) $\dfrac{-1}{15}$ IV) $\dfrac{1}{5}$ V) $\dfrac{1}{3}$

(b) (3 points) $\lim_{x \to 4^-} (f(x) - g(x))$

I) -22 II) -20 III) -10 IV) 13 V) DNE

(c) (3 points) $\lim_{x \to 2} f(g(x))$

I) -4 II) -2 III) 0 IV) 2 V) DNE

(d) (3 points) $\lim_{x \to 0} g(f(x))$

I) -10 II) -8 III) -2 IV) 10 V) DNE