Name:	mai exam	
Calculus 1 for Social Science	Name:	
Summer 2019		
Final Exam		Time Limit: 180 min

- DO NOT open the exam booklet until you are told to begin. You should write your name and section number at the top and read the instructions.
- Organize your work, in a reasonably neat and coherent way, in the space provided. If you wish for something to not be graded, please strike it out neatly. I will grade only work on the exam paper, unless you clearly indicate your desire for me to grade work on additional pages.
- You may use any results from class, homework or the text, but you must cite the result you are using. You must prove everything else.
- You needn't spend your time rewriting definitions or axioms on the exam.
- Show all of your work. You may not receive full credit for correct answers if supporting work is not demonstrated.

Question:	1	2	3	4	5	6	7	8	9	10	11	Total
Points:	12	5	5	18	5	15	5	10	5	10	10	100
Score:												

1. Evaluate the following limits. If it doesn't exist, explain why.

(a) (4 points)
$$\lim_{x \to 4} \frac{x^2 - 16}{x - 4}$$

(b) (4 points)
$$\lim_{x \to \infty} \frac{5x^4 - 3x + 2}{7x^4 + 3x^2 - 1}$$

(c) (4 points)
$$\lim_{x \to 0^+} \frac{1}{1 + 2^{-1/x}}$$

2. (5 points) Use the definition of the derivative to determine the derivative of $f(x) = \frac{-1}{x}$

3. (5 points) Find the values of x for which the function f(x) is discontinuous.

$$f(x) = \begin{cases} -2x + 1 & \text{if } x < 0 \\ x^2 + 1 & \text{if } 0 \le x \le 1 \\ \sqrt{x + 1} & \text{if } 1 < x < \infty \end{cases}$$

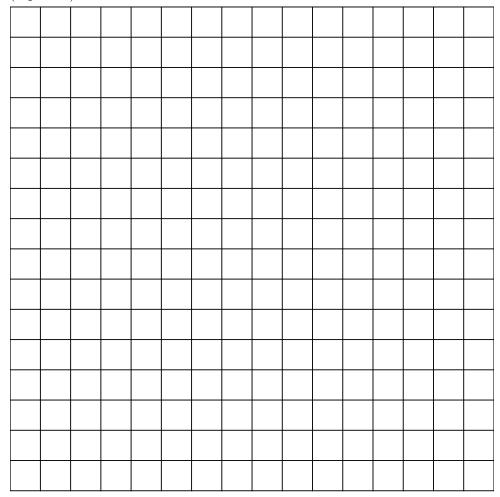
- 4. For the function $f(x) = x^3 + 2x^2 + x$
 - (a) (3 points) Find the critical numbers.

(b) (3 points) Find the intervals where f(x) is increasing and decreasing and identify any relative maximum and minimum values.

(c) (5 points) Find the regions of concavity.

(d) (2 points) Find the x-coordinate of any inflection points.

(e) (5 points) Plot the function.



5. (5 points) Find the equation of the tangent line to the curve $y^2 = x^3(2-x)$ at the point (x,y) = (-1,2).

6. Find $\frac{dy}{dx}$ for the following equations.

(a) (5 points)
$$y = \tan(x^3 + 1)$$

(b) (5 points)
$$y = \arcsin(e^{2x})$$

(c) (5 points)
$$y = (x^2 + 1) \arctan(\sqrt{x})$$

7. (5 points) Use Logorithmic differentiation to find the derivative of $y = \frac{(x^3 + 1)^4 \sin^2(x)}{\sqrt[3]{x}}$. DO NOT SIMPLIFY YOUR ANSWER.

8. A company's cost function and demand function are given by

$$C(x) = 3800 + 5x - \frac{x^2}{1000}$$
 and $p(x) = 50 - \frac{x}{100}$ for $0 \le x \le 1000$.

(a) (4 points) Compute C'(300) and give an interpretation of the results.

(b) (2 points) Find the revenue function R(x).

(c) (4 points) Find the profit function P(x) and the demand level which maximizes profit.

9. (5 points) Find the horizontal (if any) and vertical (if any) asymptote(s) of the function

$$f(x) = \frac{2x^2 - 6x}{x^2 - 9}$$

10. (10 points) A box with an open top and a square base is to have a volume of $32000~\rm{cm}^3$. Find dimensions of the box which will minimize the surface area of the box.

11. (10 points) A ladder 10ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 2 ft/s, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 6ft from the wall?