Midterm 1

Calculus I (Math 124)
Instructor: Jarod Alper
Fall 2019
October 22, 2019   **Name:**

Section:

Read all of the following information before starting the exam:

- You may use a Ti-30x IIS calculator.
- You may refer to your hand-written note sheet (8.5"x11", two-sided).
- You may not consult any other outside sources (phone, computer, textbook, other students, ...) to assist in answering the exam problems. All of the work will be your own!
- Write clearly!! You need to write your solutions carefully and clearly in order to convince me that your solution is correct. Partial credit will be awarded.
- Good luck!

Problem	Points
1 (20 points)	_____
2 (20 points)	_____
3 (20 points)	_____
4 (20 points)	_____
5 (20 points)	_____
Total (100 points)	

Problem 1. Calculate the following limits:

(a)
$$\lim_{x \to 1} \frac{x^3 - x^2}{x^2 - 1}$$

(b)
$$\lim_{x \to 2^+} \frac{\cos(\pi x)}{8 - x^3}$$

(c)
$$\lim_{x \to \infty} \frac{x + 1}{\sqrt{x^2 + 1}}$$

Problem 2. A ball is thrown into the air at time $t = 0$ seconds and the height $h(t)$ of the ball from the ground after t seconds is given in meters by the equation

$$h(t) = -5t^2 + 20t + 10.$$

(a) Find the height of the ball when it is released.

(b) Find the average velocity of the ball between the time it is released and the time it hits the ground.

(c) Find the velocity of the ball when it hits the ground.

Problem 3.

(a) Find the equation of the tangent line to the graph of
$$y = \frac{x^2 + 1}{x - 3}$$
at $(4, 17)$.

(b) Find the x-coordinates of all of the points on the graph where the tangent line is horizontal.

Problem 4. Let $f(x) = \sqrt{x^2 + 5}$. Find $f'(2)$ using the definition of the derivative as a limit.

Problem 5. Find the derivatives of the following functions:

(a) $f(x) = \frac{2\tan(x)}{x^3+1}$.

(b) $f(x) = e^{\sqrt[3]{x}\sin(x)}$.

Scrap paper