Math 1
2nd Midterm

October 20, 2016

Name (in block capital letters):

Instructor (tick one box):

- ☐ **Section 1: M. Musty (10:10)**
- ☐ **Section 2: E. Sullivan (11:30)**
- ☐ **Section 3: A. Babei (12:50)**
- ☐ **Section 4: M. Dennis (2:10)**

Instructions: You are not allowed to provide or receive help of any kind (closed book examination). However, you may ask the instructor for clarification on problems.

1. **Wait** for **signal** to begin.
2. **Write** your **name** in the space provided, and **tick one box** to indicate which section of the course you belong to.
3. Calculators, computers, cell phones, or other computing devices are **not allowed**. In consideration of other students, please **turn off cell phones** or other electronic devices which may be disruptive.
4. Unless otherwise stated, you must **justify your solutions** to receive full credit. Work that is illegible may not be graded. Work that is scratched out will not be graded.

Problem	Score	Possible
1		10
2		8
3		11
4		8
5		8
6		8
7		8
8		10
Total		71

1. (10 points) Which of the following statements are always true? Write "**T**" for true and "**F**" for false. Your computations will not be graded on this problem.

(a) ☐ $\sin(3\pi/4) = \sqrt{2}/2$.

(b) ☐ $\arcsin(\sqrt{2}/2) = 3\pi/4$.

(c) ☐ $\lim_{n\to\infty} \dfrac{5n}{12+10n} = \dfrac{1}{2}$.

(d) ☐ $\lim_{n\to\infty} \cos\left(\dfrac{1}{n}\right) = 0$.

(e) ☐ Rational functions are continuous on $(-\infty, \infty)$.

(f) ☐ If $\lim_{x\to a^+} f(x) = L$, then $\lim_{x\to a^-} f(x) = L$.

(g) ☐ If $\lim_{x\to a} f(x) = L$, then $\lim_{x\to a^-} f(x) = L$.

(h) ☐ The function $f(x) = \frac{(x-1)(x-2)}{x-1}$ has an infinite discontinuity at 1.

(i) ☐ A function can have at most one horizontal asymptote.

(j) ☐ If a is not in the domain of f, then $\lim_{x\to a} f(x)$ does not exist.

2. (8 points) Find the following values. Show your work.

   (a) $\cos\left(\frac{\pi}{6}\right)$

   (b) $\sin\left(\frac{7\pi}{6}\right)$

   (c) $\arcsin(\sin(\pi))$

3. (11 points) For each of the following inverse trigonometry problems, draw the corresponding triangles, and evaluate the expression. Show all your work.

   (a)
   $$\cos\left(\arcsin\left(\frac{5}{6}\right)\right)$$

   (b) Simplify the following expression so that in has no trigonometric functions.
   $$\tan\left(\arccos\left(\frac{x}{x+1}\right)\right)$$

4. (8 points) Evaluate the limit, if it exists. Show all your work.

(a)

$$\lim_{x \to 2} \frac{x^2 + x - 6}{(x - 2)}$$

(b)

$$\lim_{x \to 4} \frac{2 - \sqrt{x}}{4x - x^2}$$

5. (8 points)

(a) Let f be a function such that $2x + 3 \leq f(x) \leq \left(\frac{x}{3} + 2\right)^2$ when $0 \leq x \leq 5$. Evaluate $\lim_{x \to 3} f(x)$.

(b) Evaluate $\lim_{x \to 1} (x-1)^2 \sin\left(\frac{1}{1-x}\right)$.

6. (8 points) For the following functions, find all vertical and horizontal asymptotes. If there are no vertical or horizontal asymptotes, right NONE.

   (a) $f(x) = \frac{x^2-4}{(2x+3)(x-1)}$.

   Horizontal Asymptotes:

   Vertical Asymptotes:

   (b) $g(x) = \frac{x^2-9}{x+3}$.

   Horizontal Asymptotes:

   Vertical Asymptotes:

   (c) $h(x) = \arctan(4x)$.

   Horizontal Asymptotes:

   Vertical Asymptotes:

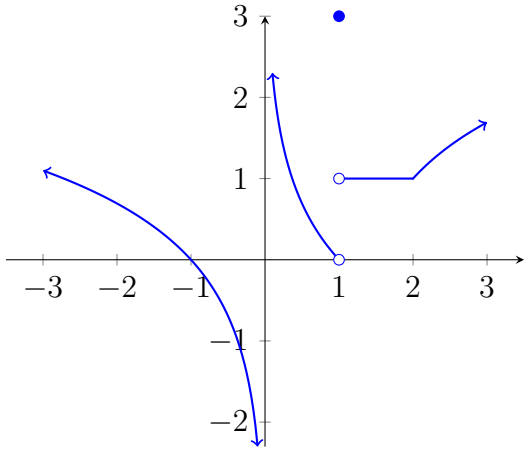
7. (8 points) For each of the sequences below, determine if the sequence converges or not. If it converges, find the limit. Justify your answers.

(a) $a_n = \dfrac{(n-1)(n^2+1)}{(3n-1)(2n+5)}$

(b) $b_n = e^{-(n^2)}$

(c) $c_n = \dfrac{(-2)^n}{3^n}$

8. (10 points) Let f be defined by the graph below.



(a) Compute $\lim_{x \to 0^-} f(x)$.

(b) Find the interval(s) where f is continuous.

(c) Find the discontinuities of f. For each discontinuity of f, determine its type (removable, jump, or infinite).

(d) Compute

$$\lim_{x \to \infty} f\left(\frac{2x^2+5}{x^2+1}\right).$$