Math 10A non-final exam, September 26, 2017

You put away all books, calculators, cell phones and other devices. You consulted a single two-sided sheet of notes. You wrote carefully and clearly, *USING WORDS* (not just symbols). The paper you handed in was your only representative when your work is graded.

Point counts:

Problem	1	2	3	4	5	6	7	Total
Points	6	6	6	6	6	5	5	40

These quick and dirty "solutions" were written by me (Ribet) just before the exam. These are not necessarily perfect, model solutions, but rather my attempt to explain the main ideas.

1. Evaluate

$$\lim_{t \to 0} \frac{\sin t - t}{t^3}.$$

2. Find all points on the interval $[0, 1]$ where the instantaneous rate of change of $f(x) = x^3 + x$ is equal to the average rate of change of $f(x)$ on the interval.

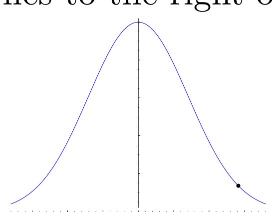
3. One can model the pulse rate (in beats per minute) of a healthy person whose height is x inches by the formula $\dfrac{592}{\sqrt{x}}$ when $30 \le x \le 100$. Use a linear approximation to estimate the decrease in pulse rate that corresponds to a height increase from 64 to 64.5 inches.

4. Calculate

$$\lim_{t \to -\infty} \sqrt{t^2 + t} + t.$$

5. Calculate $\dfrac{d}{dx}\left(\sqrt{\sin(x^2)}\right)$.

6. Find the coordinates of the inflection point on the graph of $y = e^{-x^2}$ that lies to the right of the y-axis.



You acted with honesty, integrity, and respect for others.

7. Let $a_n = \dfrac{n^n}{n!}$. Decide whether the limit $\lim_{n\to\infty} \dfrac{a_{n+1}}{a_n}$ exists and evaluate the limit if it does. [Note that $n! = 1\cdot 2\cdot 3\cdots(n-1)\cdot n$ and that our textbook defines e as the limit $\lim_{n\to\infty}\left(1+\dfrac{1}{n}\right)^n$.]