

MAT 319/320: PRACTICE MIDTERM 1
TUESDAY, SEPTEMBER 27, 2016

Your name: _____
(please print)

No books, notes, or calculators. Unless a problem explicitly states “no explanation required”, please try to write as detailed an explanation as possible. Explanations should be such that someone who does not know how to solve this problem (but knows all previous material) can follow your arguments and understand what you are doing; if in doubt, ask. Anything that is not part of your final solution (e.g., some preliminary computations) should be erased or crossed out. **Answers without explanations will get very little partial credit!**

You are allowed to use any result from the textbook, from the homeworks, or discussed in class. Anything else you need to prove.

Notation:

\mathbb{Z} — integer numbers

\mathbb{N} — positive integers

\mathbb{R} — real numbers

There are 4 problems in this exam. Each problem is worth 10 pts. You have 80 minutes. Good luck!

	1	2	3	4	Total
<i>Grade</i>					

1. (a) Give the definition of least upper bound (supremum) of a subset $A \subset \mathbb{R}$
- (b) Let $A = \{x \in \mathbb{R} \mid x^2 < 5\}$. Find $\sup A$ (with a proof that the suggested number is indeed $\sup A$.)

2. (a) State the Archimedean property of real numbers.
- (b) Prove that if a, b are real numbers such that for all natural n , $|a - b| < 1/n$, then $a = b$.

3. (a) Give the definition of limit of a sequence.
(b) Use the definition (not the limit laws!) to find the limit of the sequence

$$a_n = \frac{n+(-1)^n}{3n+2}$$

4. Find the following limits (with proofs). If a limit doesn't exist, prove it.

(a) $s_n = \frac{n^2+7n-3}{2n^3-14}$

(b) $t_n = \frac{2^n+(-1)^n}{3^n}$

(c) $r_n = \sqrt{1 + 3 \ln(n)}$

(in this part, you are allowed to use any properties of exponential and logarithmic functions you have learned in calculus/precalculus).