Homework #10

Due **Friday, October 17** in Gradescope by **11:59 pm ET**

READ Section 6.1 in Richmond&Richmond

WATCH Video 10: Exam 1 Proof Review (30:06) [Found on moodle site]

WRITE AND SUBMIT solutions to the following problems. **ALWAYS** justify your claims.

Problem 1. (16 points)

Prove that $\bigcap_{t\in(2,6)} [0, 2t+5) = [0, 9]$

Problem 2. (10 points)

Prove that there is a unique real number $c \in \mathbb{R}$ such that for all $t \in \mathbb{R}$, we have $ct - 3c + 12 = 4t$.

[Don't forget to prove **both** the existence and the uniqueness parts.]

Problem 3. (14 points)

Prove that for every $y \in [-2, 2]$, there is some $x \in [1, 3]$ such that $\dfrac{6}{x} - 4 = y$.

Problem 4. (11 points)

Define a sequence $c_1, c_2, c_3, \ldots$ of real numbers by:

$$c_1 = \frac{1}{2}, \quad \text{and for every } n \geq 1, \quad c_{n+1} = c_n - c_n^2.$$

Use mathematical induction to prove that for all $n \in \mathbb{N}$, we have $0 < c_n < 1$.

Problem 5. (14 points) Section 2.2, #12

Use mathematical induction to prove that for all integers $n \geq 2$, we have

$$\frac{1}{\sqrt{1}} + \frac{1}{\sqrt{2}} + \cdots + \frac{1}{\sqrt{n}} > \sqrt{n}.$$

(Office Hour Information on next page)

Questions? You can ask in class or in:

My (Drop-In) Office Hours (SMUD 406):

~~Mondays~~	~~2:00–3:30pm~~	**Cancelled Monday, October 13**
~~Tuesdays~~	~~1:45–3:15pm~~	**Cancelled Tuesday, October 14**
Fridays	1:00–2:00pm	

or by appointment.

This week only: Wednesday, Oct 15 1:00–2:30pm

Allison Tanguay's QCenter Drop-in Hours (SMUD 208):

Mon/Wed/Fri	10:00am–noon
Tue/Thu	1:30–4:30pm

Math Fellow Drop-in Hours (SMUD 006):

Mondays	6:00–7:30pm	**Aaron** Cordoba
Mondays	7:30–9:00pm	**John** Lim
Tuesdays	6:00–7:30pm	**Aaron** Cordoba
Tuesdays	7:30–9:00pm	**Gretta** Ineza
Wednesdays	7:30–9:00pm	**John** Lim
Thursdays	6:00–7:30pm	**Gretta** Ineza

WARNING: Office hours, QCenter hours, and Fellow hours are generally cancelled on vacation days!

In particular, for Fall Break (Monday, Oct 13 and Tuesday, Oct 14):

- My Monday/Tuesday office hours are cancelled (but I'm adding hours on Wednesday, Oct 15, 1–2:30pm).
- Allison's Monday/Tuesday Drop-in hours are cancelled.
- Monday evening Fellow Drop-in hours are cancelled, but:
- Aaron **will** hold his Tuesday 6–7:30pm Drop-in hours

You may still email me any time at `rlbenedetto@amherst.edu`