Fall 2016
Math 5615H: Introduction to Analysis.

Class Times and Location:
12:20 pm – 13:10 pm MWF, Bruininks Hall 117.

Instructor: Mikhail Safonov, VinH 231, tel: 625-8571,
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Office Hours: MW: 13:25 pm –14:15 pm, F: 11:15 am – 12:05 pm, or by appointment.

Textbook: *Walter Rudin*, Principles of Mathematical Analysis, 3rd edition, 1976.
We tentatively plan to cover Chapters 1–5 during Fall semester, and Chapters 6–9, 11 during Spring semester 2017. Notes will be provided for material not covered by this book.

Homeworks: There will be 9 homeworks due at the beginning of class on Wednesdays, 9/21, 9/28; 10/5, 10/19, 10/26; 11/2, 11/9, 11/16; and 12/7. Late homework will receive less that full credit, and possibly zero credit. The grading for homeworks will be based on a selection of a few problems unknown to the class in advance (3–5 ones, depending on the difficulty).

Midterm Exams:
on Wednesday, October 12 (6th week) and Monday, November 21 (12th week), during class time.

Final Exam: Tuesday, December 20, 8:00 am–10:00 am, Bruininks Hall 117.

No books, notes, and calculators will be permitted during Midterm and Final Exams.

Grading: *Homeworks* - 20% of the total grade for 8 (out of 9) best ones,
Midterm Exams - 20% for each one, *Final Exam* - 40%.

Missed exams: Make-up Final exams will be given to students who have a **valid** reason for missing an exam. Such students must notify their instructor prior to the exam, and the reason must be documented. There will be **no make-up Midterm exams**. A proportional part of the score for the Final exam will be used instead for students who have a valid documented reason for missing a Midterm exam.

Homework #1 (due on Wednesday, September 21):
I. Exercises 2, 4, 8 in Chapter 1 of the textbook.
II. 1. Verify if the following real numbers are rational or irrational:

$$(\mathbf{a})\ \sqrt{2}+\sqrt{3}, \quad (\mathbf{b})\ \sqrt{2}+\sqrt[3]{3}, \quad (\mathbf{c})\ \sqrt{3+\sqrt{8}}-\sqrt{3-\sqrt{8}}.$$

2. Prove that the numbers $A_n=(1+\sqrt{2})^n+(1-\sqrt{2})^n$ are integers for all $n=0,1,2,,\dots$.
3. Represent the periodic decimal fraction $r=0.(461538)=0.461538461538\dots$ in the form $r=m/n$ with integers m and n.
4. Define $e^{it}=\cos t+i\sin t$, where $i^2=-1$. Show that $e^{i(s+t)}=e^{is}\cdot e^{it}$.
5. Using the fact (without proof) that the algebraic equation $z^n=r\cdot e^{it}$, where $r>0,\ n=1,2,\dots$, has n distinct roots

$$z_k=\sqrt[n]{r}\cdot e^{i(t+2k\pi)/n}; \quad k=0,1,\dots,n-1,$$

write the polynomial z^4+4 in the form $(z-z_0)(z-z_1)(z-z_2)(z-z_3)$, and group together linear factors in order to represent it as

$$z^4+4=(z^2+p_1z+q_1)(z^2+p_2z+q_2) \quad \text{with } \textbf{real} \quad p_{1,2},\ q_{1,2}.$$