Sample problems for Final
Math 301 Introduction to Proof Fall 2023

- The Final is comprehensive. Syllabus: Chapters 1,2 3, 4, Section 5.1, 5.2 Irrational numbers.
- For problems for Chapters 1-4 see homework problems and sample problems for Exams 1 & 2.
- Format of the Final will be similar to that of Exam 1 & Exam 2.

1. Using idea similar to the proof for $\sqrt{2}$, prove the irrationality of the following numbers :

(1) Prove that $\sqrt{3}$ is irrational.
(2) Prove that $\sqrt{6}$ is irrational.
(3) Prove that $\sqrt{2}+\sqrt{3}$ is irrational.
(4) Prove that $\sqrt{5}$ is irrational.
(5) Prove that $\sqrt[3]{2}$ is irrational.

2. Prove that there are infinitely many positive integers n such that $\sqrt{n}$ is irrational.

3. Problems

(1) Section 2.4, pg 80, # 4
(2) Section 3.2, pg 126, # 20
(3) Section 4.1, pg 147, # 7
(4) Section 4.1, pg 147, # 8
(5) Section 4.2, pg 167, # 2
(6) Section 4.2, pg 167, # 3
(7) Section 4.2, pg 167, # 7

4. Function problem sheet

5. Induction problem sheet

6. Definitions : Inductive set, weakly inductive set, Principle of induction, Generalized principle of induction, Second priniciple of induction, Well-ordering principle. (and definitions om sample problems for Exam 2).

7. Theorem 5.17 (Prime factorization) or Theorem 5.21a) (Division Algorithm)