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Math 330 - 02 Homework (Fall 2017)

- LaTeX-ed solutions are encouraged and appreciated.
- If you use LaTeX, hand-in a printed version of your homework.
- You are encouraged to discuss homework problems with classmates, but such discussions should NOT include the exchange of any written material.
- Writing of homework problems should be done on an individual basis.
- References to results from the textbook and/or class notes should be included.
- The following lists should be considered partial and tentative lists until the word complete appears next to it.
- Use 8.5in x 11in paper with smooth borders. Write your **name** on top of **each page**. Staple all pages.

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Problem Set 12 (complete) Due: 12/08/2017. Board presentation: 12/08/2017

- 1. Prove that if \$A\$ and \$B\$ are finite sets, then \$A\union B\$ is a finite set.
- 2. Prove the following corollary to Proposition 13.6.
 - I. If \$f:A\to B\$ is injective and \$B\$ is finite, then \$A\$ is finite.
 - II. If \$g:A\to B\$ is surjective and \$A\$ is finite, then \$B\$ is finite.
- 3. Do Project 13.15, finding a formula for the bijection in the picture.
- 4. Prove Theorem 13.28.

Problem Set 11 (complete) Due: 12/01/2017. Board Presentation: 12/01/2017

- 1. Write down the details of the proofs that the sum of a rational number and an irrational number is irrational, and that the product of a non-zero rational number and an irrational number is irrational.
- 2. Prove the converse of Prop. 11.2
- 3. Do Project 11.14
- 4. Prove that for all x,y,z,win\R\$ with z,wneq 0\$, $$$\frac{x}{z}+\frac{y}{w}=\frac{xw+yz}{zw}\qquad \frac{xy}{z}+\frac{y}{w}=\frac{xy}{z}}$
- 5. Consider the set $A=\chi x\in X^2<2$ }\$\$ Show that \$A\$ is non-empty and has an upper bound in \$\Q\$, but

does not have a least upper bound in \$\Q\$. Hint: by way of contradiction, assume \$A\$ has a least upper bound \$u\$ in \$\Q\$, and compare it with \$\sqrt{2}\$.

6. Consider the sequence defined recursively by $a_n=a_{n-1}+3a_{n-2} \ a_1=1 \ a_2=2.$ Use the converse of Proposition 11.25 to find a closed formula for \$a n\$.

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