Ziv Epstein
Combinatorics
Assigment 01
09/7/2014

Shahriari 1.1.2
Find the pattern and make a conjecture as a complete mathematical sentence, and prove it of the following sequence:

$$\frac{1}{1\cdot 2}, \frac{1}{1\cdot 2}+\frac{1}{2\cdot 3}, \frac{1}{1\cdot 2}+\frac{1}{2\cdot 3}+\frac{1}{3\cdot 4}$$

Shahriari 1.1.4
Find the pattern and make a conjecture as a complete mathematical sentence, and prove it of the following sequence:

$$(1-\frac{1}{4}), (1-\frac{1}{4})(1-\frac{1}{9}), (1-\frac{1}{4})(1-\frac{1}{9})(1-\frac{1}{16})$$

Shahriari 1.1.5
Comment on mathemtical inductive proof on all people having the same sex.

Shahriari 1.1.7
Find the pattern and make a conjecture as a complete mathematical sentence, and prove it of the following sequence: The average of the first n terms of $(n+1)2^n$

Shahriari 1.1.12
The classic minister problem

Shahriari 1.2.2
Given only the following information, what is the strongest conclusion that follows?

$$\forall k, P(k) \implies P(k+1), P(181) \text{ is false.}$$

Shahriari 1.2.4
Prove $f_1 + f_3 + \cdots + f_{2n-1} = f_{2n} - 1$, where f is the Fibonacci sequence.

Shahriari 1.2.5
Let f_n be the n-th Fibonacci number. We consider the sequence of Fibonacci numbers together with their squares:

n	0	1	2	3	4	5	6	$\cdots$
f_n :	1	1	2	3	5	8	13	$\cdots$
f_n^2 :	1	1	4	9	25	64	169	$\cdots$

Find a formula of the form

$$f_n^2 = f_? f_? + ?$$

for f_n^2 in terms of the Fibonacci numbers. Prove your assertion.