Sept 12
Monday

Due on Wednesday is 1st draft for groups
FRIDAY redo inductions homework

BASE CASE

2. $f_{n-1} \times f_{n+1} = f_n^2 + (-1)^n$

$f_{2-1} \times f_{2+1} = f_2^2 + (-1)^2$

$1 \times 2 = 1^2 + (-1)^2$

$2 = 2$

Prove that $P(n) \Rightarrow P(n+1)$

$P(n)$ is $f_{n-1} \times f_{n+1} = f_n^2 + (-1)^n$

group WORK

Induction Proofs for sums

Recall:

① $1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$

② $1 + x + x^2 + x^3 + \ldots x^{n-1} = \frac{x^n - 1}{x - 1}$

③ $\frac{1}{1 \cdot 2} +$

typical form of such questions says
Prove that for some function $f(i)$
we have $f(1) + f(2) \ldots + f(n) = g(n)$
for some function $g(n)$

1) $f(i) = i \quad g(n) = \frac{n(n+1)}{2}$

$f(i) = x^{i-1}$ $\qquad g(n) = \frac{x^n - 1}{x-1}$

$f(i) = \frac{1}{i(i+1)}$ $\qquad g(n) = \frac{n}{n+1}$

Proof by induction

$P(n)$ is the statement $\sum_{i=1}^{n} f(i) = g(n)$
and want to prove this for all n

$f(1)+f(2)+f(3) = g(3)$ | $n=3$

$f(1)+f(2) = g(2)$ | $n=2$ → $\qquad$ check that $f(1) = g(1)$

$f(1) = g(2)$ | $n=1$ → $\qquad$ by plugging in $n=1$ for both sides

How do you get from one case to the next case?

$f(1) + \ldots f(K) = g(K)$ | $n = K$

if we assume $P(k)$ ie $\sum_{i=1}^{K} f(i) = g(k)$
we show $P(k+1)$ is as follows:

assume $f(1) \ldots + f(K) = g(K)$ $P(K)$ statement

Add another term

want to show that $f(1) + \ldots f(k) + f(K+1) = g(K) + f(k+1)$

prove this $g(K) + f(K+1) = g(K+1)$

for any particular example of $P(555)$ then you proved by induction