

Due Wednesday, September 12, 2001.

1. Prove by induction that for every integer  $p \geq 1$ ,

$$\sum_{k=1}^p k^2 = \frac{p(p+1)(2p+1)}{6}.$$

2. Prove by contradiction that if  $n$  is an integer and  $n^2$  is even, then  $n$  is even.
3. Prove by the contrapositive method that if  $c$  is an odd integer, then the equation  $n^2 + n - c = 0$  has no integer solution for  $n$ .
4. Prove by construction that if  $m$  and  $n$  are two consecutive integers, then 4 divides  $m^2 + n^2 - 1$ .