Jennifer Cafiero

I pledge my honor that I have abided by the Stevens Honor System.

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1. 1. It will be proved that for the positive integer n ≥ 1, 12 = 1((1)+1)(2(1)+1)/6  
      12 = 1 \* 2 \* 3 / 6
   2. Basis step, P(1):   
      12 = 1\*((1)+1)\*(2(1)+1)/6  
      1 = 2\*3/6  
      1 = 1
   3. Inductive Hypothesis: 12 + 22 + … + k2 = k (k +1) (2k + 1)/6
   4. P(k + 1) = 12 + 22 + … + k2 + (k + 1)2 = (k + 1) (k + 2) (2(k + 1) + 1)/6  
      12 + 22 + … + k2 + (k + 1)2 =
   5. (12 + 22 + … + k2) + (k + 1)2 =   
       = [2k2 + k +6k + 6] = (2k2 + 7k +6)  
       = =
   6. Since the basis step and inductive step are done, the principle of mathematical induction states that the statement is true for every positive integer n.
2. Prove that 2 divides n^2 + n whenever n is a positive integer  
   Basis step: 12 + 1 = 2  
   Inductive hypothesis: k2 + k is divisible by 2  
   Inductive step:   
    (k + 1)2 + (k + 1) = k2 + 2k +1 + k + 1 = (k2 + 3k + 2) = (k2 + k) + 2(k + 1)  
   This step proves that the sum of a multiple of 2 and a multiple of 2 is divisible by 2

Section 5.2

1. 1. 3, 6, 9, 10, 12, 13, 15, 16, and n ≥ 18
   2. P(n) means n is the amount of postage you can create with 3 and 10-cent stamps. P(n) is true for all n ≥ 18  
      Basis step: Let Q(6) = P(18) ^ P(19) ^ P(20):   
      18 = 3\*6, 19=10\*1 + 3\*3, and 20 = 10\*2.  
      Inductive Hypothesis: Suppose that Q(n – 1) is true, then there must be such that:   
      3a1 +10b1 = 3n -3  
      3a2+10b2 = 3n – 2  
      3a3+10b3 = 3n – 1   
      Then we find:   
      3(a1 + 1) + 10b1 = 3n  
      3(a2 + 1) + 10b2 = 3n + 1  
      3(a3 + 1) + 10b3 = 3n + 2
   3. P(n) means n is the amount of postage you can create with 3 and 10-cent stamps.  
      Basis step: Let S(n) mean that P(k) is true for all P(6)= S(18) ^ S(19) ^ S(20):   
      18 = 3\*6, 19=10\*1 + 3\*3, and 20 = 10\*2.   
      Inductive Hypothesis: For n > 20, if S(n) is true, then P(n-2) is also true. Since P(n-2) is true, there exists a, that satisfies 3a + 10b = n -2. If we add 3 to both sides we get 3(a+1) + 10b = n + . Therefore P(n+1) is true.

Section 5.3

1. 1. f(2) = 2 + 3(-1) = 2 – 3 = -1   
      f(3) = -1 + 3(2) = -1 + 6 = 5  
      f(4) = 5 + 3(-1) = 5 – 3 = 2  
      f(5) = 2 + 3(5) = 2 + 15 = 17
2. P(n) = f­1 + f3 + … + f2n-1= f2n  
   Basis step: f1 = 1 = ­f­2 -> P(1) is true.  
   Inductive hypothesis: P(k) is true.  
   Inductive step, where n = k +1: f1 + f3 + … + f2k-1 + f2k+1 = f2k + f2k+1 = f2k+2 = f2(k+1)

(define (increasing? numList)   
 (if (or (null? numList) (null? (cdr numList)))   
 #t   
 (if (>= (car numList) (cadr numList))   
 #f   
 (increasing? (cdr numList)))))

Prove the function returns true for the increasing list (1, 2)

Let R(n) be f1 < f2 < … < fn.

Basis step: P(1) is true because f1 = 1 <f2.

Inductive step: Assume R(k) is true. Then f1 < f2< … < fk

y=k+x  
Prove that (k, y) is increasing.   
k ≥ y? If it isn’t, recursive call.   
cdr of y null? #t  
For any integer x>0, list starting with k, where following integers are k+x, the function will return #t.