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ECE 369 Homework 2

Mathematical Proofs, Program Proofs

Proof Techniques

Text Exercise 2.1

Problems 51, 55

1. For x = 3, the product of x and x square is 27 which obviously is not even.
2. For any integer n,

Therefore, for any integer n, is always true.

Induction

Text Exercise 2.2

Problems 40(b), 53

1. Base case n = 1,

Assume is true

Then which K+1 is correct.

Hence

1. Base case n = 1,

Assume, where a is an integer

Then

for x is not equal to 1, which K+1 is correct.

Hence

Program Proofs

Text Exercise 2.3

Problem 15

1. Base case n = 1, , n = 2,

Assume is true

Then which means Q(k+1) is correct.

Hence.

At loop termination, . The function is correct.

Additional Problems

A. whose end is determined only by

where

* 1. i=0, end with 0
  2. i=1, end with 1
  3. i=2, end with 4
  4. i=3, end with 9
  5. i=4, end with 6
  6. i=5, end with 5
  7. i=6, end with 6
  8. i=7, end with 9
  9. i=8, end with 4
  10. i=9, end with 1

Obviously from above, any square of positive integer end with 0,1,4,5,6, or 9.

B. Determine which Fibonacci numbers are even and use a form of mathematical induction to prove your hunch.

1. Base case F (0) = 0, F (3) = 2

Assume for any positive integer k which can be divided by 3, is even

Then F(K+3) = F(K+2) + F(K+1) = F(K+1) +F(K) +F(K+1) = 2F(K+1) + F(K)

which F(K) is even. So F(k+3) is even.

Hence, for any positive integer k which can be divided by 3, is even.