Part 2:

Homework 6: 5.1: 4, 20

4. Let be the statement that for the positive integer .

1. What is the statement ?

is the base case.

1. Show that is true, completing the basis step of the proof.

13 = 1, (1 \* (1 + 1)/2)2  = (2 / 2)2 = 1

1. What is the inductive hypothesis?
2. What do you need to prove the inductive step?
3. Complete the inductive step, identifying where you use the inductive hypothesis.

Given

Algebra

Algebra

Simplification

Simplification

Inductive Hypothesis

1. Explain why these steps show that this formula is true whenever is a positive integer.

These steps show that this formula is true when n is a positive integer because you implement the base case and the inductive case, proving

where is true for all n.

20. Prove that if is an integer greater than 6.

Base Case: n = 7:

Inductive hypothesis: for

Inductive step:

1. Simplification

2. Simplification

3. By Induction Hyp.

4. By step 2

5. Because

6. By step 1, 5

7. By step 4, 6

Part 3:

(define (expo n i)

(cond

[(eq? i 0) 1]

[else (\* n (expo n (- i 1) ) ) ] ) )

Part 4:

Using the standard definition, prove that

for all natural numbers .

Hints: The exponent function is defined recursively so we need to reason

by induction. The equation involves three numbers, but the recursive

calls are for the exponent, which suggests that the induction should be on

and/or on . It turns out that you can do it by induction on . What does

that mean? It means to prove where is

is true because

Base Case:

is true because

Inductive Case:

Integer Power

Associative

Induction Hypothesis

Integer Power

Therefore,

and