Drew Pulliam – DTP180003

CS3345.0U1

Assignment 1

1. = /

------------------------------------------------------------------------------------------------------------------------------------------

1. 2(k(k+1)/2) + k

------------------------------------------------------------------------------------------------------------------------------------------

1. prove false by counterexample, use n = 10. 10^3 = 1000, 2^10 = 1024

because 1000 is not greater than 1024 the statement is false

------------------------------------------------------------------------------------------------------------------------------------------

1. prove that the square of an even number is also even.

Assume square of even number is odd, given even number a, a^2 = a+a+…+a (any multiplication can be written as a series of additions)

The sum of any two even numbers is an even number,

therefore the sum of all these even numbers is even,

therefore the square of an even number is also even.

------------------------------------------------------------------------------------------------------------------------------------------

1. A. Basis step: n= 1, sum is 1, (1^2)(2^2)/4 = 1, so it is true for basis n=1

Inductive Step: Assume true for k

Sum k^3 = (k^2) \* ((k+1)^2) / 4

Show true for k+1:

Sum (k+1)^3 = (sum k^3) + (k+1)^3

= [ k^2 \* (k+1)^2 / 4 ] + [ (k+1)^3 ]

= [ k^4 + 6k^3 + 13k^2 + 12k + 4 ] / 4 --- expanded

= [ (k+1)(k+1)(k+2)(k+2) ] / 4 --- factored

= [ (k+1)^2 \* ((k+1)+1)^2 ] / 4

Conclusion: by induction, the statement is true for all n>=1

------------------------------------------------------------------------------------------------------------------------------------------

B. Basis step: n=1, 1^2 – 1 = 0 = even, so it is true for basis n=1

Inductive Step: Assume true for k

k^2 – k = even for any k >= 1

Show true for k+1:

Since k^2 – k = even it can be expressed as 2 \* an integer, so k^2 – k = 2a

(k+1)^2 – (k+1) = 2b ?

= k^2 + 2k + 1 – k – 1

= k^2 + k

= (k^2 – k) + 2k

= 2a + 2k

= 2(a+k) = 2b

Conclusion: by induction, the statement is true for all n>=1

------------------------------------------------------------------------------------------------------------------------------------------

1. T(10) = 29

------------------------------------------------------------------------------------------------------------------------------------------

1. T(N) = 2 + (N – 1) \* 3

------------------------------------------------------------------------------------------------------------------------------------------

1. Basis step: n= 2, answer is 5, 2 + (2 -1) \* 3 = 5, so it is true for basis n=2

Inductive Step: Assume true for k

T(k) = 2 + (k – 1) \* 3

Show true for k+1:

T(k+1) = 2 + ((k+1) – 1) \* 3 ?

= T(k) + 3

= (2 + (k – 1) \* 3) + 3

= 2 + (k – 1 + 1) \* 3

= 2 + ((k+1) – 1) \* 3

Conclusion: by induction, the statement is true for all n>1