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CS 225 – Discrete Structures in CS

Homework 5, Part 1

Set 5.2: problems 12, 15

Set 5.3: problems 10, 18, 27

12. , for every integer n≥ 1. Prove by induction:

Basis step: show P(1) is true.

Induction step:

Hypothesis: assume P(k) is true, so P(k+1) is true, for some integer k.

.

. [suppose inductive hypothesis is true]

And this is the right side of P(k+1). Therefore the property of n=k+1 holds true.

15. , for every integer n≥ 1. Prove by induction:

Basis step: show P(1) is true.

Left: 1(1!)= 1

Right: (1+1)!-1

2!-1=(1x2)-1=1

So P(1) is true

Inductive hypothesis: For all integers k≥ 1, and suppose P(k) is true.

Inductive step: We will show that for all integers k≥ 1, if P(k) is true then P(k+1) is true.

Left:

k=1, left side is 5

Right:

(k+2)!-1

New right side: = (k+1)![1+(k+1)]-1

k=1, right side is 5

Therefore:

Since the new left is 5 when k+1 is substituted for 1+1 and the new right side is the same, then the property of n=k+1 is true.

10.

Basis step: show P(0) is true.

Inductive step:

Hypothesis: For every integer k≥ 0, if P(k) is true then P(k+1) is true.

LHS:

Therefore: The property holds true for n=k+1.

18.

Basis step: show P(2) is true

Inductive hypothesis: We must show that P(2) holds true.

RHS:

Assuming P(k) is true, we must show that P(k+1) holds true for any integer k≥ 2.

Therefore: The property holds true.

27. for the sequence is defined by

Basis step: show P(1) is true

Inductive hypothesis: The basis step was already proven true in the question or given information. P(1) holds true.

Inductive step: We must show that if P(1) is true then P(k+1) for any integer k≥1.

Therefore: The property holds true for n=k+1.