Assignment 5 Part 2

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5.4 -2 Suppose b_1, b_2, b_3 is a sequence defined as such

$b_1 = 4 \quad b_2 = 12 \quad b_k = b_{k-2} + b_{k-1}$ for all integers $k \geq 3$

Prove b_n is divisible by 4 for all integers $n \geq 1$

$P(n)$ b_n is divisible by 4

note that both $b_1 = 4$ and $b_2 = 12$ and both 4 and 12 are divisible by 4

Therefore $P(1)$ and $P(2)$ are both true.

Let k be any integer with $k \geq 4$ and suppose

i is divisible by 4

i is from 4 to k

we must show that $k+1$ is also divisible by 4

$b_{k+1} = b_{(k+1)-2} + b_{(k+1)-1}$

$b_{k+1} = b(k-1) + b_k$ since we know $b_k = b_{k-2} + b_{k-1}$

$b_{k+1} = b(k-1) + b_{k-2} + b_{k-1}$

5.4 -10 Let $P(n)$ be "n¢ can be obtained using a combination of 3¢ and 5¢. Use strong mathematical induction to prove that $P(n)$ is true for all integers $n \geq 8$

$P(14)$ can be made from (3) 3¢ + 5¢

$P(15)$ can be made from (3) 5¢

$P(16)$ can be made from (2) 5¢ + (2) 3¢

Let there be an integer k where $k \geq 8$ and $P(i)$ is true for all integers i from 2 through k. Then I will show that $P(k+1)$ is also true

$P(k+1) = [(k+1)-3]+3$ if $k \geq 16$ then $(k+1)-3 \geq 14$

8	3	5
9	333	0
10		55
11	33	5
12	3333	
13	3	55
14	333	5
15		555
16	33	55

5.4 -29 It is a fact that every integer $n \geq 1$ can be written in the form

$c_r \cdot C^r + c_{r-1} \cdot C^{r-1} + \ldots + c_2 \cdot C^2 + c_1 \cdot 3^1 + c_0$

where $c_r = 1$ or 2 and $c_i = 0, 1,$ or 2 for all integers $i = 0, 1, 2, \ldots r-1$

sketch a proof of this fact

Let the property $P(n)$ be the equation $C_r \cdot C^r + C_{r-1} \cdot C^{r-1} + \ldots + c_2 \cdot c^2 + c_1 \cdot 3^1 + C_0$

$P(1)$ Let $r = 0$ an $C_i = 1$. We can then express $C_r \cdot C^r = 1$

If we want to prove that all int ≥ 1 can be expressed this way we must show that both odd and even number $(2k)$ and $(2k+1)$ can be expressed as such.

if $k+1/2$ is an integer since $1 \leq (k+1)/2 \leq k$ then

$\frac{k+1}{2} = c_r \cdot 2^r + c_{r-1} \cdot$