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CS 3305 Project 1

Basis: $(1,5) \in S$ and $(3,7) \in S$

Recursive: if $(a,b) \in S$ then $(3a+1, 3b-7) \in S$

if $(a,b) \in S$ and $(c,d) \in S$ then $(2a+d, 2b+c) \in S$

Prove for any $(x,y) \in S$, $x+4=y$

basis: $(1,5) \in S$, $1+4=5$ ✓

$(3,7) \in S$, $3+4=7$ ✓

Inductive step: assume $(a,b) \in S$ and $(c,d) \in S$

$b = a+4$, $d = c+4$ by definition

rule 1: $(3a+1, 3b-7) \in S$

$= (3a+1, 3(a+4)-7) \in S$

$= (3a+1, 3a+5) \in S$

$(3a+1)+4 = 3a+5$ ✓

rule 2: $(2a+d, 2b+c) \in S$

$= (2a+(c+4), 2(a+4)+c) \in S$

$= (2a+c+4, 2a+c+8) \in S$

$(2a+c+4)+4 = 2a+c+8$ ✓

$\therefore$ by SI, if $(x,y) \in S$, then $x+4=y$

Part 2

based on part 1, we can say that (1000, 1004) MIGHT be in S
it does follow the rule that if $(x,y) \in S$, then $x+4=y$
However, part 1 did NOT prove that ALL sets of (x,y) (where
$x+4=y$) $\in S$