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Individual Assignments #58

Assignment: *4.3: 2(a,b), 8, 24, 26a, 28a, 32a*

Q2

a) f(1) = -2*f(0) = -2*3 = 6
   f(2) = -2*f(1) = -2*-6 = 12
   f(3) = -2*f(2) = -2*12 = -24
   f(4) = 2*f(3) = -2*-24 = 48
   f(5) = 2*f(4) = -2*48 = -96

b) f(1) = 3*f(0) +7 = 3*3+7 = 16
   f(2) = 3*f(1) +7 = 3*16 +7 = 55
   f(3) = 3*f(2) + 7 = 3*55 + 7 = 172
   f(4) = 3*f(3) + 7 = 3*172 + 7 = 523
   f(5) = 3*f(4) +7 = 3*523 + 7 = 1576

Q8

Part A

Base Step: $a_1 = 2$

Recursive Step $a_{n+1} = a_n + ?$

? = 4*(n+1)-2-(4n-2)

? = 4n+4-2-4n+2

? = 4

$a_{n+1} = a_n + 4$

Part B

Base Step: $a_1 = 0$

Recursive Step $a_{n+1} = a_n + ?$

$? = 1+(-1)^{n+1} – (1+(-1)^n)$

$? = (-1)\,(-1)^n – (-1)^n$

$? = -2(-1)^{n+1}$

$a_{n+1} = a_n - 2(-1)^{n+1}$

Part C

Base Step: $a_1 = 2$

Recursive Step $a_{n+1} = a_n + ?$
$? = (n+1)(n+1+1)-(n(n+1))$
$? = n(n+1)+(n+1)+(n+1)-n(n+1)$
$? = 2(n+1)$
$a_{n+1} = a_n +2(n+1)$

Part D

Base Step: $a_1 = 1$

Recursive Step $a_{n+1} = a_n + ?$
$? = n^2 +2n+1-n^2$
$? = 2n+1$
$a_{n+1} = a_n +2n+1$

Q24

a) BASE: $1 \in S$, RECURSIVE: If $n \in S$, then $n+2 \in S$.
b) BASE: $1 \in S$, RECURSIVE: If $n^3 \in S$, then $(n+2)^3 \in S$.
c) BASE: $(0,0) \in S$, RECURSIVE: If $(a,b) \in S$ then $(a+1,b) \in S$, $(a,b+1) \in S$, $(a+1,b+1) \in S$

Q26a

Step 1

Starting pair: (0,0)

Results: (2,3);(3,2)

Step 2

Starting pairs: (2,3);(3,2)

Results: (4,6);(5,5);(6,4)

Step 3

Starting pairs: (4,6);(5,5);(6,4)

Results: (6,9);(7,8);(8,7);(9,6)

Step 4

Starting pairs: (6,9);(7,8);(8,7);(9,6)

Results: (8,12);(9,11);(10,10);(11,9);(12,8)

Step 5

Starting pairs: (8,12);(9,11);(10,10);(11,9);(12,8)

Results: (10,15);(11,14);(12,13);(13,12);(14,11);(15,10)

28a

BASE: (1,2) ∈S OR (2,1) ∈S

RECURSIVE: If (a,b) ∈S then (a+2,b) ∈S, (a,b+2) ∈S

32a

BASE: Ones(λ) = 0 (where λ is the empty string)

RECURSIVE: Ones(Sx) = $\begin{cases} 1 + Ones(S), if\ x = 1 \\ 0 + Ones(S), if\ x = 0 \end{cases}$