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2.3.

8.

a. $\lfloor 1, 1 \rfloor = 1$

x. $\lfloor 2, 99 \rfloor = 2$

b. $\lfloor 1, 1 \rfloor = 2$

y. $\lfloor -2, 99 \rfloor = -2$

c. $\lfloor -0, 1 \rfloor = 0$

g. $\lfloor 1/2 + \lfloor 1/2 \rfloor \rfloor = \lfloor 1/2 + 1 \rfloor = 1$

d. $\lfloor -0, 1 \rfloor = 0$

h. $\lfloor \lfloor 1/2 \rfloor + \lfloor 1/2 \rfloor + 1/2 \rfloor = 2$

9.

a. $\lfloor 3/4 \rfloor = 1$

l. $\lfloor 3 \rfloor = 3$

b. $\lfloor 7/8 \rfloor = 0$

j. $\lfloor -1 \rfloor = -1$

c. $\lfloor -3/4 \rfloor = 0$

q. $\lfloor 1/2 + \lfloor 3/2 \rfloor \rfloor = 2$

d. $\lfloor -7/8 \rfloor = -1$

h. $\lfloor 1/2 \cdot \lfloor 5/2 \rfloor \rfloor = 1$

10.

a.

b.

c.

$a \rightarrow b$

$a \rightarrow b \neq$

$a \rightarrow d \neq$

$b \rightarrow a$

$b \rightarrow b \neq$

$b \rightarrow b$

$c \rightarrow c$

$c \rightarrow d$

$c \rightarrow c$

$d \rightarrow d$

$d \rightarrow c$

$d \rightarrow d \neq$

\Rightarrow One-to-one

\Rightarrow Not one-to-one

\Rightarrow Not one-to-one



11

a. Onto

b. Not onto ($\exists a \notin \text{target set}$)

c. Not onto ($a \notin \text{target set}$)

16.

a. Each student ~~must~~ has a unique mobile phone number

b. Each student has a unique ID number

c. Each student gains a ~~different~~ final grade

d. Each student is from a different home town

35)

a) $\{1\}$

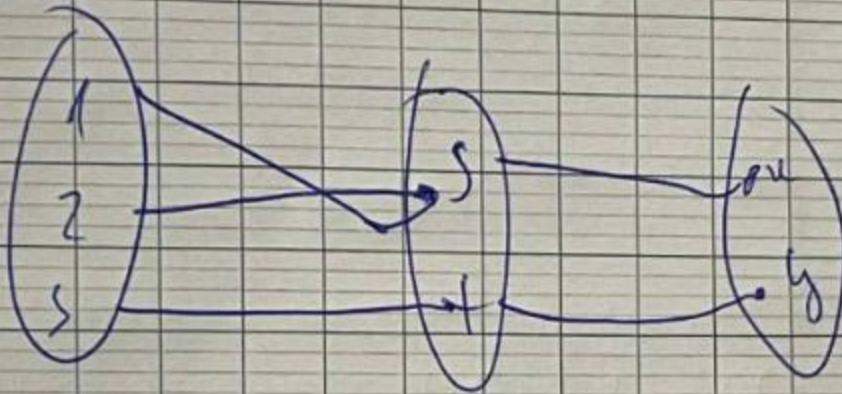
b) $\{-1; 1, 5; 9; 15\}$

c) $\{0, 1; 2\}$

d) $\{0, 1; 5; 16\}$

2.3

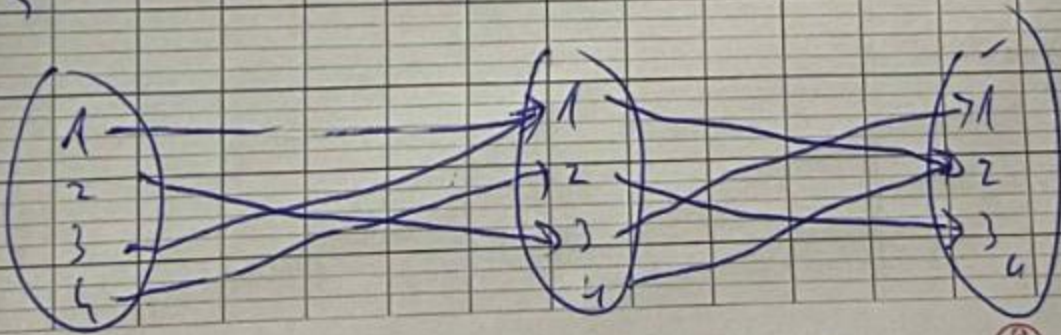
64



$$A \xrightarrow{f} B \xrightarrow{g} C$$

$$\Rightarrow g \circ f = \{(\overset{x,1}{\cancel{1,1}}), (\overset{x,2}{\cancel{2,2}}), (\overset{y,3}{\cancel{3,3}})\}$$

65



A *Một trạng vớ một tương lai* B \xrightarrow{g}



31) a) $\{-2, -1, 0, 1, 2, 3\}$
 b) $\{0, 1, 2, 3, 4, 5\} \Rightarrow \{0, 1, 2, 3, 4, 5\}$
 c) $\{1, 5, 7, 11\} \Rightarrow \{0, 1, 2, 3, 4, 5\}$
 d) $\{1, 12, 33, 65\}$

24

1) $a_n = 2(-3)^n + 5^n$
 a) $a_0 = 2(-3)^0 + 5^0 = 7$
 b) $a_1 = 2(-3)^1 + 5^1 = -1$
 c) $a_2 = 2(-3)^2 + 5^2 = 34$
 d) $a_3 = 2(-3)^3 + 5^3 = 125$

29) a) $a_0 = 2$
 $a_1 = 6, a_2 = 12$
 $a_3 = 252$
 $a_4 = 2552$

b) $a_n = a_{n-1}^2 - 1, a_0 = 2$
 $\Rightarrow a_1 = 2^2 - 1 = 3$
 $\Rightarrow a_2 = 3^2 - 1 = 8$
 $\Rightarrow a_3 = 8^2 - 1 = 63$
 $\Rightarrow a_4 = 63^2 - 1 = 3968$

c) $a_n = a_{n-1} + 2a_{n-2}, a_0 = 1, a_1 = 2$

$\Rightarrow a_2 = a_1 + 2a_0 = 5$
 $\Rightarrow a_3 = a_2 + 2a_1 = 11, a_4 = 20$

d) $a_n = n a_{n-1} + a_{n-2}^2$
 $a_0 = 1, a_1 = 2$
 $\Rightarrow a_2 = 2a_1 + a_0^2 = 6$
 $a_3 = 3a_2 + a_1^2 = 27$
 $a_4 = 4a_3 + a_2^2 = 904$

e) $a_n = a_{n-1} + a_{n-2}, a_0 = 1, a_1 = 2, a_2 = 3$

$\Rightarrow a_3 = a_2 + a_1 = 5$
 $a_4 = 8$

11)

a) $a_n = 2^n + 3^n + 5^n$
 $a_0 = 2^0 + 3^0 + 5^0 = 3$
 $a_1 = 2 + 3 + 5 = 10$
 $a_2 = 4 + 9 + 25 = 38$
 $a_3 = 8 + 27 + 125 = 160$
 $a_4 = 16 + 81 + 625 = 722$

$$\begin{aligned}
 d) \quad a_n &= 2(-4)^n + 3 \quad (1) \\
 a_n &= -3 \cdot a_{n-1} + 4 \cdot 4^{n-1} \\
 &= -3 \cdot (2(-4)^{n-1} + 3) + 4 \cdot 2 \cdot (-4)^{n-2} \\
 &= -6 \cdot (-4)^{n-1} - 9 + 8 \cdot (-4)^{n-2} \\
 &= 24(-4)^{n-2} - 8 \cdot (-4)^{n-2} + 9 \\
 (1) &= 2(-4)^n + 3 \\
 &\Rightarrow \text{solution}
 \end{aligned}$$

17)

$$a) \quad a_n = 3a_{n-1}, \quad a_0 = 2$$

$$\begin{aligned}
 \Rightarrow a_1 &= 6 & a_n &= 3 \cdot 2^n \\
 a_2 &= 18 & a_5 &= 3 \cdot 2^5 = 96 \\
 a_3 &= 54 & a_6 &= 3 \cdot 2^6 = 192
 \end{aligned}$$

$$b) \quad a_n = a_{n-1} + 2, \quad a_0 = 3$$

$$\begin{aligned}
 \Rightarrow a_1 &= 5 \\
 a_2 &= 7 \\
 a_3 &= 9 \\
 a_4 &= 11 \\
 a_5 &= 13
 \end{aligned}$$

$$\begin{aligned}
 c) \quad a_n &= a_{n-1} + 1, \quad a_1 = 2 \\
 \Rightarrow a_n &= a_1 + (n-1) \cdot 1 = n \\
 a_2 &= 2 \\
 a_3 &= 3 \\
 a_4 &= 4 \\
 a_5 &= 5
 \end{aligned}$$

$$\begin{aligned} b) \quad a_1 &= 5a_1 - 6a_1 \\ 49 &= 5 \cdot 17 - 36 \\ 49 &= 49 \\ &\Rightarrow \text{True} \end{aligned}$$

$$\begin{aligned} a_2 &= 5a_2 - 6a_1 \\ 143 &= 5 \cdot 49 - 6 \cdot 17 \\ 143 &= 143 \\ &\Rightarrow \text{True} \end{aligned}$$

$$\begin{aligned} a_3 &= 5a_3 - 6a_2 \\ 421 &= 5 \cdot 143 - 6 \cdot 49 \\ 421 &= 421 \Rightarrow \text{True} \end{aligned}$$

$$\begin{aligned} c) \quad a_n &= 5a_{n-1} - 6a_{n-2} \\ a_n &= 5 \left(2 \cdot 2^{n-1} + 5 \cdot 3^{n-2} \right) - 6 \left(2 \cdot 2^{n-2} + 5 \cdot 3^{n-3} \right) \\ a_n &= 10 \cdot 2^{n-2} - 6 \cdot 2^{n-2} + 75 \cdot 3^{n-2} - 30 \cdot 3^{n-2} \\ a_n &= 2^2 \cdot 2^{n-2} + 5 \cdot 3^2 \cdot 3^{n-2} \\ a_n &= 2^n + 5 \cdot 3^n \\ &\Rightarrow \text{True} \end{aligned}$$

$$\begin{aligned} 12) \quad a) \quad a_n &= 0 \\ a_n &= -3a_{n-1} + 4a_{n-2} \\ 0 &= 0 \\ &\Rightarrow \text{solution} \end{aligned}$$

$$\begin{aligned} b) \quad a_n &= 1 \\ a_n &= -3a_{n-1} + 4a_{n-2} \\ 1 &= -3 + 4 = 1 \\ &\Rightarrow \text{solution} \end{aligned}$$

$$\begin{aligned} c) \quad a_n &= (-4)^n \\ (-4)^n &= -3a_{n-1} + 4a_{n-2} \\ (-4)^n &= -3(-4)^{n-1} + 4(-4)^{n-2} \\ &= (12+4)(-4)^{n-2} \\ -4^n &= -4^n \\ &\Rightarrow \text{solution} \end{aligned}$$

$$f \circ g = \{(1, 3), (2, 1), (3, 1), (4, 5)\}$$

$$g \circ f = \{(1, 2), (2, 1), (3, 2), (4, 5)\}$$

2.4.

13.

$$a. a_n = 8a_{n-1} - 16a_{n-2}$$

$$\Leftrightarrow 0 = 0 - 0$$

\Rightarrow is a solution

$$b. a_n = 8a_{n-1} - 16a_{n-2}$$

$$\Leftrightarrow 1 = 1 - 1 \neq 0$$

$$\Leftrightarrow 1 \neq 0$$

\Rightarrow not a solution

$$c. a_n = 8a_{n-1} - 16a_{n-2}$$

$$= 8 \cdot 2^{n-1} - 16 \cdot 2^{n-2}$$

$$= 2^3 \cdot 2^{n-1} - 2^4 \cdot 2^{n-2}$$

$$\Leftrightarrow 2^n \neq 0$$

\Rightarrow not a solution

$$d. a_n = 8a_{n-1} - 16a_{n-2}$$

$$= 8 \cdot 4^{n-1} - 16 \cdot 4^{n-2}$$

$$= 2 \cdot 4^n - 4^n$$

$$\Leftrightarrow 4^n = 4^n$$

\Rightarrow is a solution

$$e. a_n = 8a_{n-1} - 16a_{n-2}$$

$$= 8(n-1)4^{n-1} - 16(n-2)4^{n-2}$$

$$= 2(n-1)4^n - (n-2)4^n$$

$$= 4^n(2n-2-n+2)$$

$$\Leftrightarrow n4^n = n4^n$$

\Rightarrow is a solution

$$f. a_n = 8a_{n-1} - 16a_{n-2}$$

$$= 8(2 \cdot 4^{n-1} + 3(n-1)4^{n-1}) - 16(2 \cdot 4^{n-2} + 3(n-2)4^{n-2})$$

$$= 4 \cdot 4^n + 16(n-1)4^n - 2 \cdot 4^n - 3(n-2)4^n$$

$$= 4^n(4 + 16n - 16 - 2 - 3n + 6)$$

$$= 4^n(3n + 2)$$

$$= 2 \cdot 4^n + 3n \cdot 4^n$$

\Rightarrow is a solution

$$\Leftrightarrow 2 \cdot 4^n + 3n \cdot 4^n = 2 \cdot 4^n + 3n \cdot 4^n$$

\Rightarrow is a solution

$$\begin{aligned} g. a_n &= 8a_{n-1} - 16a_{n-2} \\ &= 8(-4)^{n-1} - 16(-4)^{n-2} \\ &= -2 \cdot (-4)^n - \cancel{16}(-4)^n = \cancel{-18}(-4)^n \end{aligned}$$

$$\Rightarrow (-4)^n \neq -3 \cdot (-4)^n$$

\Rightarrow Not a solution

$$\begin{aligned} h. a_n &= 8a_{n-1} - 16a_{n-2} \\ &= 8(n-1)^2 \cdot 4^{n-1} - 16(n-2)^2 \cdot 4^{n-2} \\ &= 2(n-1)^2 \cdot 4^n - (n-2)^2 \cdot 4^n \\ &= 4^n (2n^2 - 4n + 2 - n^2 + 8n - 4) \end{aligned}$$

$$\Leftrightarrow n^2 4^n \neq 4^n (n^2 - 2)$$

\Rightarrow Not a solution

15.

$$a. a_n = a_{n-1} + 2a_{n-2} + 2n - 9$$

$$= (-n+2+1) + 2 \cdot (-n+4) + 2n - 9$$

$$\Leftrightarrow -n+7 = -n+2$$

\Rightarrow is a solution

$$b. a_n = a_{n-1} + 2a_{n-2} + 2n - 9$$

$$= (5(-1)^{n-1} - (n-1) + 2) + 2 \cdot (5(-1)^{n-2} - (n-2) + 2 + 2n - 9)$$

$$= (5(-1)^n - n + 3) + 2 \cdot (5(-1)^n - n + 4) + 2n - 9$$

$$= -5(-1)^n - n + 3 + 10(-1)^n - 2n + 8 + 2n - 9$$

$$= 5(-1)^n - n + 2$$

$$\Leftrightarrow 5(-1)^n - n + 2 = 5(-1)^n - n + 2$$

\Rightarrow is a solution

$$c. a_n = a_{n-1} + 2a_{n-2} + 2n - 9$$

$$= (3(-1)^{n-1} + 2^{n-1} - (n-1) + 2) + 2(3(-1)^{n-2} + 2^{n-2} - (n-2) + 2 + 2n - 9)$$

$$= -3(-1)^n + 2^{n-1} - n + 3 + 6(-1)^n + 2^{n-1} - 2n + 8 + 2n - 9$$

$$= 3(-1)^n + 2^n - n + 2$$

$$\Leftrightarrow 3(-1)^n + 2^n - n + 2 = 3(-1)^n + 2^n - n + 2$$

\Rightarrow is a solution

$$\begin{aligned}
 d. a_n &= a_{n-1} + 2a_{n-2} + 2n - 9 \\
 &= (7 \cdot 2^{n-1} - (n-1) + 2) + 2(7 \cdot 2^{n-2} - (n-2) + 2) + 2n - 9 \\
 &= 7 \cdot 2^{n-1} - n + 3 + 7 \cdot 2^{n-1} - 2n + 8 + 2n - 9 \\
 &= 14 \cdot 2^{n-1} - n + 2
 \end{aligned}$$

\Rightarrow is a solution