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2.3.

8.

$$a. \lceil 1,1 \rceil = 1$$

$$b. \lceil 1,1 \rceil = 2$$

$$c. \lceil -0,1 \rceil = -1$$

$$d. \lceil -0,1 \rceil = 0$$

$$e. \lceil 2,99 \rceil = 2$$

$$f. \lceil -2,99 \rceil = -2$$

$$g. \lceil 1/2 + \lceil 1/2 \rceil \rceil = \lceil 1/2 + 1 \rceil = 1$$

$$h. \lceil \lceil 1/2 \rceil + \lceil 1/2 \rceil + 1/2 \times 1 \rceil = 2$$

9.

$$a. \lceil 3/4 \rceil = 1$$

$$b. \lceil 7/8 \rceil = 0$$

$$c. \lceil -3/4 \rceil = 0$$

$$d. \lceil -7/8 \rceil = -1$$

$$f. \lceil 3 \rceil = 3$$

$$g. \lceil -1 \rceil = -1$$

$$g. \lceil 1/2 + \lceil 3/2 \rceil \rceil = 2$$

$$h. \lceil 1/2 \cdot \lceil 5/2 \rceil \rceil = 1$$

10.

a.

$$a \rightarrow b$$

$$b \rightarrow a$$

$$c \rightarrow c$$

$$d \rightarrow d$$

$$\Rightarrow \text{One-to-one}$$

b.

$$a \rightarrow b *$$

$$b \rightarrow b *$$

$$c \rightarrow d$$

$$d \rightarrow c$$

$$\Rightarrow \text{Not one-to-one}$$

c.

$$a \rightarrow d *$$

$$b \rightarrow b$$

$$c \rightarrow c$$

$$d \rightarrow d *$$

$$\Rightarrow \text{Not one-to-one}$$

11

- a. Onto
- b. Not onto ($\exists x \in A$ s.t. $\emptyset \in B$)
- c. Not onto ($a \notin B$)

16.

- a. Each student ~~must~~ has a unique mobile phone number
- b. Each student has a unique ID number
- c. Each student gains a ~~of~~ different final grade
- d. Each student is from a different home town

85)

a) $\{1\}$

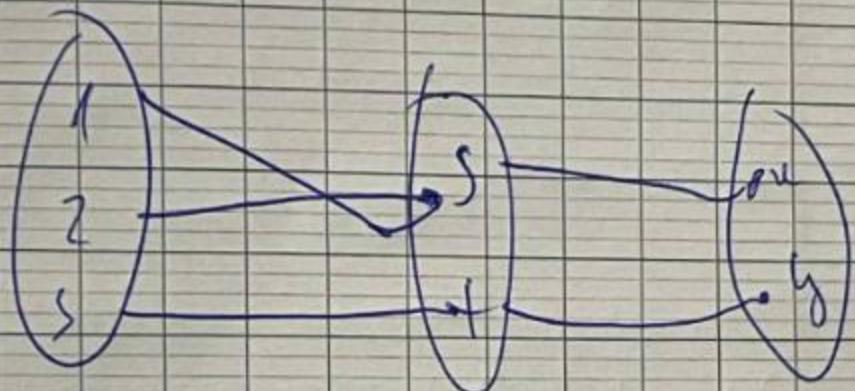
b) $\{-1; 1, 5; 9, 15\}$

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

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

2.3

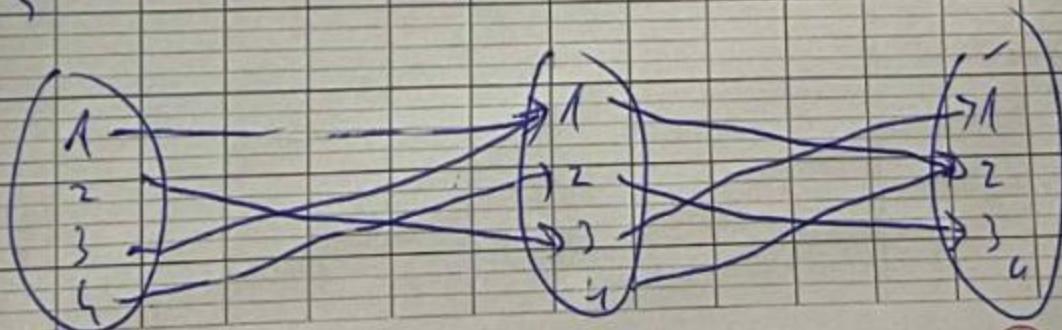
64



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

$$\Rightarrow g \circ f = \{(1, u), (1, v), (2, u)\}$$

65



A

Một trong số một tương lai

\xrightarrow{f}

B

\xrightarrow{g}

C
THOOK

34) a) $\{-2, -1; 0, 1, 2, 3\}$
 b) $\{0, 1, 2, 3, 4, 5\} \Rightarrow \{0, 3, 5\}$
 c) $\{1, 2, 3, 11\} \Rightarrow \{1, 2, 3, 6, 10\}$
 d) $\{1, 12, 33, 68\}$

2.4

a) $a_n = (-3)^n + 5^n$
 $\Rightarrow a_0 = 2 \cdot (-3)^0 + 5^0 = 3$
 b) $a_1 = 2 \cdot (-3)^1 + 5^1 = -1$
 c) $a_8 = 2 \cdot (-3)^8 + 5^8 = 787$
 d) $a_5 = 2 \cdot (-3)^5 + 5^5 = 2639$

89) a) $a_0 = 2$

$a_n = 5 \cdot a_{n-1}$
 $\Rightarrow a_2 = 2 \cdot 5 = 10$
 $a_3 = 250$

b) $a_n = a_1^n - 1, a_1 = 2$

$\Rightarrow a_2 = 2^2 - 1 = 3$
 $\Rightarrow a_3 = 2^3 - 1 = 7$
 $a_4 = 256; a_5 = 65536$

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

$\Rightarrow a_2 = a_1 + 2a_0 = 5$
 $\Rightarrow a_3 = 11; a_4 = 28$

d) $a_n = n \cdot a_{n-1} + n^2 \cdot a_{n-2}$

$a_0 = 1, a_1 = 2 \times 2$

$\Rightarrow a_2 = 2a_1 + 2^2 \cdot a_0 = 6$

$a_3 = 27$

$a_4 = 904$

e) $a_n = a_{n-1} + a_{n-2}, a_0 = 1, a_1 = 2, a_2 = 0$

$\Rightarrow a_3 = a_2 + a_1 = 1$

$a_4 = 3$

11)

a) $a_n = 2^n \cdot 3^n \cdot 5$

$a_1 = 2^0 \cdot 3^0 \cdot 5 = 5$

$a_6 = 17$

$a_4 = 481$

$a_2 = 45$

$$d) a_n = 2(-4)^n + 3 \quad (1)$$

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

$$\begin{pmatrix} 1 \\ 1 \end{pmatrix} = 2(-4)^{n-2} \\ \Rightarrow \text{solutien}$$

17)

$$a) q_1 = 3, a_{n-1} = ? \quad a_0 = ?$$

$$\begin{aligned} \Rightarrow a_1 &= c & a_n &= 324 \\ a_2 &= 18 & q_5 &= 572 \\ a_3 &= 54 & a_4 &= 162 \end{aligned}$$

$$b) a_n = a_{n-1} + 2, a_6 = ?$$

$$\begin{aligned} \Rightarrow q_1 &= 5 \\ q_2 &= 7 \\ q_3 &= 9 \\ q_4 &= 11 \\ q_5 &= 13 \end{aligned}$$

$$c) a_n = a_{n-1} + 1, q_i = ?$$

$$\begin{aligned} \Rightarrow q_1 &= a_1 + 1 - 1 = 2 \\ q_2 &= 4 \\ q_3 &= 2 \\ q_4 &= 11 \\ q_5 &= 16 \end{aligned}$$

$$\begin{aligned} b) \quad a_1 &= 5a_1 - 6a_1 \\ a_1 &= 5 \cdot 17 - 3c \\ a_1 &= 65 \\ \Rightarrow &\text{ True} \end{aligned}$$

$$\begin{aligned} a_2 &= 5a_1 - 6a_1 \\ a_2 &= \{ \cdot 4 \} - 6 \cdot 17 \\ a_2 &= 143 \end{aligned}$$

$$\begin{aligned} \Rightarrow &\text{ True} \\ a_4 &= 5a_3 - 6a_2 \\ a_4 &= 5 \cdot 143 - 6 \cdot 49 \\ a_4 &= 421 \Rightarrow \text{ True} \end{aligned}$$

$$\begin{aligned} c) \quad a_n &= 5a_{n-1} - 6a_{n-2} \\ a_n &= 5(2^{n-1} \cdot 5 \cdot 3^{n-2}) - 6(2^{n-2} \cdot 5 \cdot 3^{n-2}) \\ a_1 &= 10 \cdot 2^{n-2} - 6 \cdot 2^{n-2} + 75 \cdot 3^{n-2} - 30 \cdot 3^{n-2} \\ a_1 &= 2^{n-2}(10 - 6) + 3^{n-2}(75 - 30) \\ a_1 &= 2^{n-2} \cdot 4 + 3^{n-2} \cdot 45 \end{aligned}$$

\Rightarrow True

$$\begin{aligned} 12) \quad a_1 a_1 &= 0 \\ a_1 &= -3a_{n-1} + 4a_{n-2} \\ 0 &= 0 \\ \Rightarrow &\text{ solution} \end{aligned}$$

$$\begin{aligned} b) \quad a_1 = 1 \\ a_1 &= -3a_{n-1} + 4a_{n-2} \\ \Rightarrow 1 &= -3 + 4 = 1 \\ \Rightarrow &\text{ solution} \end{aligned}$$

$$\begin{aligned} c) \quad a_1 &= (-4)^n \\ (-4)^n &= -5a_{n-1} + 4a_{n-2} \\ (-4)^n &= -5(-4)^{n-1} + 4(-4)^{n-2} \\ &> (12+4)(-4) \\ -4^n &= -4^n \\ \Rightarrow &\text{ solution} \end{aligned}$$

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

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

2.4.

13.

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

$$\Leftrightarrow 0 = 0 - 0$$

\Rightarrow is a solution

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

$$\Leftrightarrow \cancel{0} = 1 - 1 \cancel{- 0}$$

$$\Leftrightarrow 1 \neq 0$$

\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

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

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

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

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

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

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

\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

$$\begin{aligned}
 g. a_n &= 8a_{n-1} - 16a_{n-2} \\
 &= 8(-4)^{n-1} - 16(-4)^{n-2} \\
 &= -2(-4)^n - \cancel{16}(-4)^n \geq \cancel{-3}(-4)^n
 \end{aligned}$$

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

\Rightarrow Not a solution

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

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

\Rightarrow Not a solution

15.

$$\begin{aligned}a. \quad a_n &= a_{n-1} + 2a_{n-2} + 2n - 9 \\&= (-n+2+1) + 2 \cdot (-n+4) + 2n - 9\end{aligned}$$

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

\Rightarrow is a solution

$$\begin{aligned}b. \quad a_n &= a_{n-1} + 2a_{n-2} + 2n - 9 \\&= (5(-1)^{n-1} - (n-1) + 2) + 2 \cdot (5(-1)^{n-2} - (n-2) + 2 + 2n - 9) \\&= (-5(-1)^n - n + 3) + 2 \cdot (5(-1)^n - n + 4) + 2n - 9 \\&= -5(-1)^n - n + 3 + 10(-1)^n - 2n + 8 + 2n - 9 \\&= 5(-1)^n - n + 2\end{aligned}$$

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

\Rightarrow is a solution

$$\begin{aligned}c. \quad a_n &= a_{n-1} + 2a_{n-2} + 2n - 9 \\&= (3 \cdot (-1)^{n-1} + 2^{n-1} - (n-1) + 2) + 2(3(-1)^{n-2} + 2^{n-2} - (n-2) + 2) + 2n - 9 \\&= -3(-1)^n + 2^{n-1} - n + 3 + 6(-1)^n + 2^{n-1} - 2n + 8 + 2n - 9 \\&= 3(-1)^n + 2^n - n + 2\end{aligned}$$

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

\Rightarrow is a solution

$$\begin{aligned}d. a_n &= a_{n-1} + 2a_{n-2} + 2n - 9 \\&= (7 \cdot 2^{n-1} - (n-1) + 2) + 2(7 \cdot 2^{n-2} - (n-2) + 2) + 2n - 9 \\&= 7 \cdot 2^{n-1} - n + 3 + 7 \cdot 2^{n-2} - 2n + 8 + 2n - 9 \\&= 44 \cdot 2^{n-1} - 7 \cdot 2^{n-2} - n + 2\end{aligned}$$

\Rightarrow is a solution