IN SLIDE EXERCISE FOR CHAPTER 2

GROUP 5

SECTION 03 - SEM 1, 2024/2025

SECI1013 *(DISCRETE STRUCTURE)*

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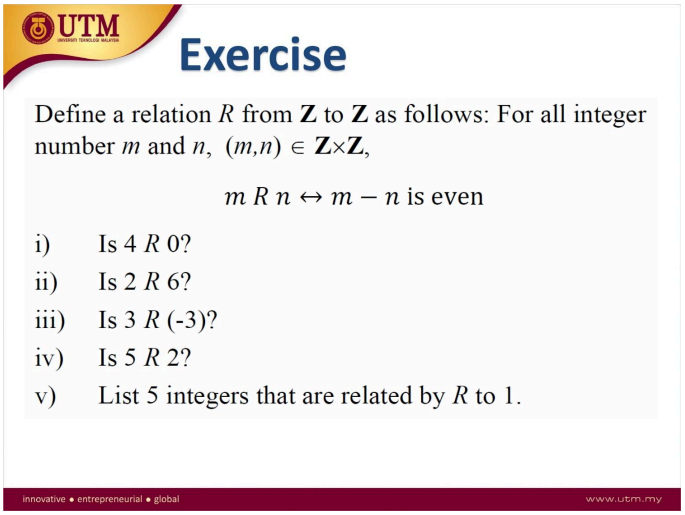
" Finite sets, boundless utility."



ANSWER:

i) Yes

ii) Yes

iii) Yes

iv) No

v) 3, 5, 7, 9, 11

Exercise

An airline services the five cities c_1, c_2, c_3, c_4 and c_5. Table below gives the cost (in dollars) of going from c_i to c_j. Thus the cost of going from c_1 to c_3 is RM100, while the cost of going from c_4 to c_2 is RM200

To from	c_1	c_2	c_3	c_4	c_5
c_1		140	100	150	200
c_2	190		200	160	220
c_3	110	180		190	250
c_4	190	200	120		150
c_5	200	100	200	150	

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If the relation R on the set of cities $A = \{c_1, c_2, c_3, c_4, c_5\}$: $c_i \, R \, c_j$ if and only if the cost of going from c_i to c_j is defined and less than or equal to RM180.

i) Find R.

ii) Matrices of relations for R

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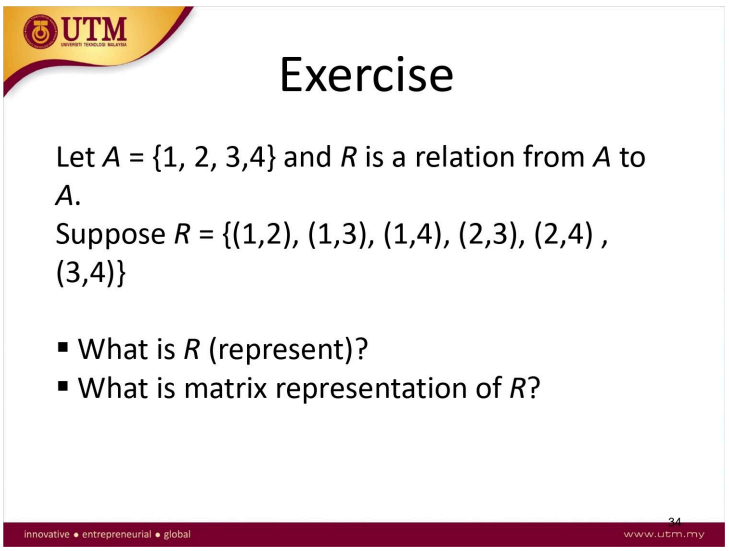
ANSWER:

i) $R = \{(c_1, c_2), (c_1, c_3), (c_1, c_4), (c_2, c_4), (c_3, c_1), (c_3, c_2), (c_4, c_3), (c_4, c_5), (c_5, c_2), (c_5, c_4)\}$

ii)

$$R = \begin{array}{c} \\ c_1 \\ c_2 \\ c_3 \\ c_4 \\ c_5 \end{array} \begin{array}{c} \begin{array}{ccccc} c_1 & c_2 & c_3 & c_4 & c_5 \end{array} \\ \begin{pmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{pmatrix} \end{array}$$

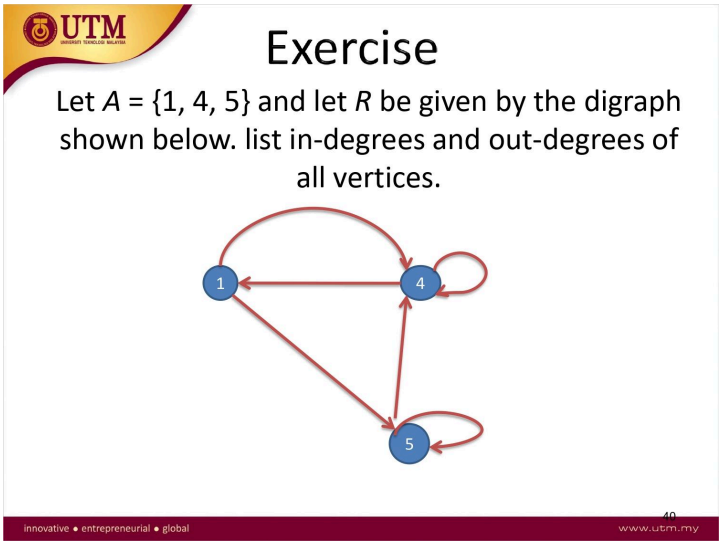


ANSWER:

R is a relation from A to A such that $x \in A$, $y \in A$, $(x, y) \in A \times A$ and $R \subseteq A \times A$.
R can be defined by $x, y \in A$, $x \, R \, y \leftrightarrow y > x$.

Matrix representation of R:

$$R = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{pmatrix} 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{pmatrix} \end{array}$$



ANSWER:

	1	4	5
in - degree	1	3	2
out - degree	2	2	2

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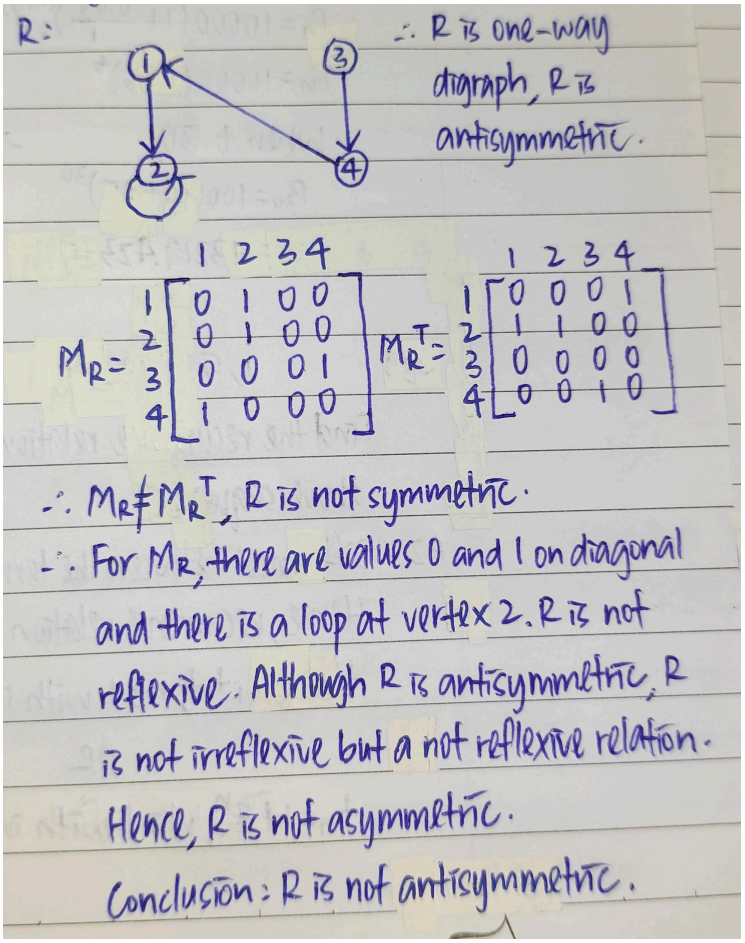
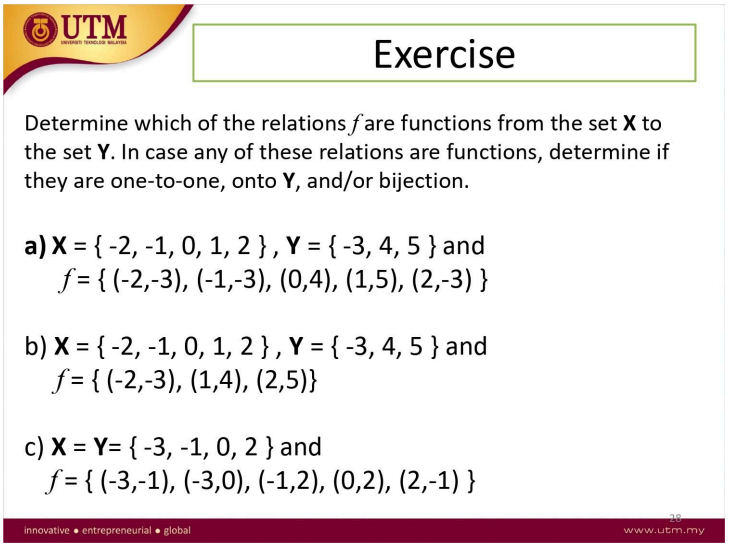
Exercise

1. Let A={1,2,3,4} and let R = {(1,2), (2,2), (3,4), (4,1)}

Determine whether R symmetric, asymmetric or antisymmetric.

ANSWER:



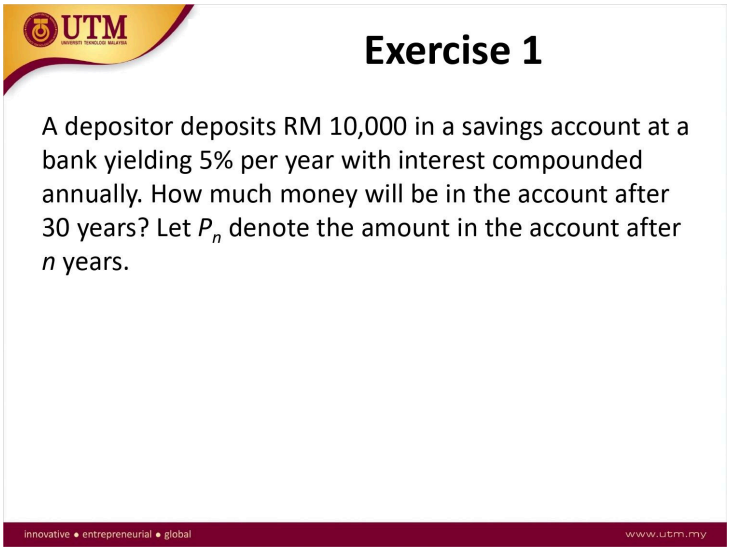


ANSWER:

(a) *f* is a function from set X to set Y, not one-to-one function and it is onto Y.

(b) *f* is not a function. Not all elements in set X are mapped onto set Y.

(c) *f* is not a function. Many-to-many function is not proper.



ANSWER:

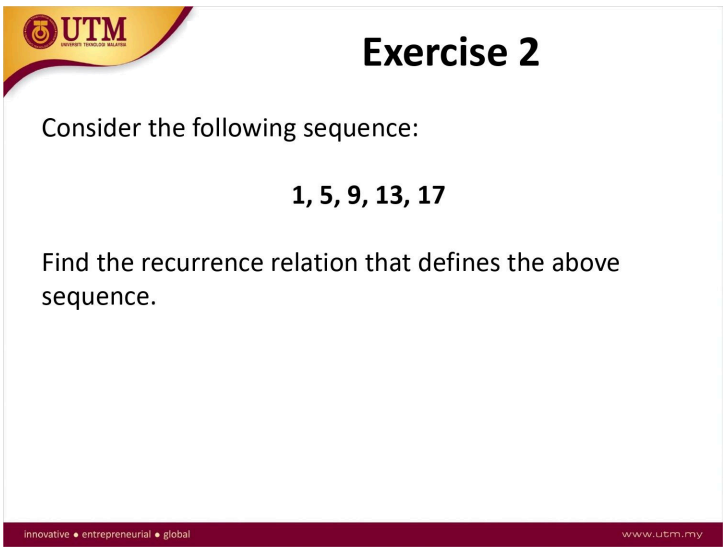
Compound interest formula: $A = P\ (1 + \frac{r}{n})^{nt}$

$$P_n = 10000\ (1 + \frac{0.05}{1})^{n}$$
$$P_n = 10000\ (1.05)^{n}$$

P_n = amount after n^{th} year
10000 = principal amount
0.05 = annual interest rate (decimal)
1 = number of times interest is compounded per year
n = time (year)

$P_{30} = 10000\ (1.05)^{(30)}$
$= 43219.42375$

$\therefore P_{30} = RM43219.42$



ANSWER:

Difference between terms = +4

Recurrence relation:

$$a_n = a_{n-1} + 4, n \geq 1, a_0 = 1$$

Exercise 3

A basketball is dropped onto the ground from a height of 15 feet. On each bounce, the ball reaches a maximum height 55% of its previous maximum height.

a)Write a recursive formula, a_n, that completely defines the height reached on the n_{th} bounce, where the first term in the sequence is the height reached on the ball's first bounce.

b)How high does the basketball reach after the 4_{th} bounce? Give your answer to two decimal places.

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ANSWER:

(a) $a_n = 0.55a_{n-1}, n \geq 1, a_0 = 8.25$

(b) 4^{th} bounce, $n = 3$;

$a_1 = 0.55a_0$
$= 0.55(8.25)$
$= 4.5375$

$a_2 = 0.55a_1$
$= 0.55(4.5375)$
$= 2.495625$

$a_3 = 0.55a_2$
$= 0.55(2.495625)$
$= 1.37259375$

$\therefore 4^{th}$ bounce $= 1.37$ ft.