Exercise 1

Let A = {0, 1, 2, 3, 4} and B = {0, 1, 2, 3}. For each of the relations R from A to B listed below list all pairs (a, b) $\in \mathbb{R}$ and write the corresponding {0, 1}-indicator-matrix.

a. a = b : (0, 0), (1, 1), (2, 2), (3, 3)

$$\begin{matrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{matrix}$$

b. a + b = 4 : (1, 3), (2, 2), (3, 1), (4, 0)

$$\begin{matrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{matrix}$$

c. a > b : (1, 0), (2, 0), (2, 1), (3, 0), (3, 1), (3, 2), (4, 0), (4, 1), (4, 2), (4, 3)

$$\begin{matrix} 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 1 & 1 & 1 \end{matrix}$$

d. a divides b : (1, 0), (2, 0), (3, 0), (4, 0), (1, 1), (1, 2), (2, 2), (1, 3)

$$\begin{matrix} 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{matrix}$$

Exercise 2

For each of these relations on the set {1, 2, 3, 4} decide whether or not it is reflexive, symmetric, antisymmetric, and transitive.

a. {(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)}

b. {(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)}

c. {(2, 4), (4, 2)}

d. {(1, 2), (2, 3), (3, 4)}

e. {(1, 1), (2, 2), (3, 3), (4, 4)}

f. {(1, 3), (1, 4), (2, 3), (2, 4), (3, 1), (3, 4)}

Relation	R	S	A	T
a	0	0	0	1
b	1	1	0	1
c	0	1	0	1
d	0	0	1	0
e	1	1	1	1
f	0	0	0	1