Exercise (Binary Relations)

① $A = \{2, 3, 4, 5, 6\}$

a) $R = \{(2,3), (3,4), (4,5), (5,6)\}$ what is the set-builder representation of this relation?

b) Represent the above relation using a matrix.

c) Represent the above relation using a graph.

② does the following relation on $S = \{1, 2, 3, 4\}$ have reflexivity, irreflexivity, symmetry, antisymmetry, asymmetry or transitivity?

$R = \{(1,1), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2)\}$

③ Is the relation $R = \{(1,1), (2,2), (3,3), (1,2), (2,1)\}$ on $S = \{1, 2, 3\}$ a equivalence relation? If so what are the equivalence classes?

④ Is $R = \{(a,b) \in A \times A \mid a|b\}$, $A = \{1, 2, 3, 4, 6\}$ a partial order? If so draw the Hasse diagram. ($a|b$ is a divides b)

⑤ $A = \{10, 11, 12, 13, 14\}$

$R_1 = \{(a,b) \in A \times A \mid b = a+1\}$

$R_2 = \{(a,b) \in A \times A \mid b = a+2\}$

a) $R_1 \cup R_2$

b) $R_1 \cap R_2$

c) $R_1 - R_2$

d) R_1^{-1}

e) R_2^{-1}

f) R_1^2

⑥ $A = \{x, y, z\}$

$B = \{1, 2, 3, 4\}$

$C = \{d, e, f\}$

$R_1 = \{(y, 3), (z, 1)\} \subseteq A \times B$

$R_2 = \{(1, e), (1, d), (4, d)\} \subseteq B \times C$

What is $R_2 \circ R_1$?