

ASSIGNMENT 9, DUE FRIDAY 13 APRIL

1. Let A and B be finite sets having m and n elements, respectively. How many relations are there from A to B ?

2. Let $A = \{a, b, c, d, e, f\}$ and $B = \{1, 2, 3, 4, 5\}$. Consider the relation

$$R = \{(a, 2), (a, 4), (b, 2), (d, 2), (d, 5), (e, 1), (e, 4)\}$$

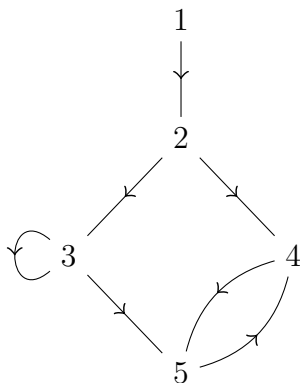
from A to B . Find the sets $\text{Dom } R$, $\text{Rng } R$ and R^{-1} .

3. Let A , B and R be as in the previous question and let $C = \{\clubsuit, \diamond, \heartsuit, \spadesuit\}$. Consider the relation

$$S = \{(1, \diamond), (1, \spadesuit), (3, \diamond), (4, \clubsuit), (4, \spadesuit), (5, \heartsuit), (5, \spadesuit)\}$$

from B to C . Find $S \circ R$, $\text{Dom } S \circ R$ and $\text{Rng } S \circ R$.

4. Let $A = \{1, 2, 3, 4, 5\}$ and consider the relation R on A (i.e., the relation from A to A) whose directed graph is



Draw the directed graph for $R \circ R$.

5. Let A , B , C and D be sets. If R is a relation from A to B , S a relation from B to C and T a relation from C to D , prove that $T \circ (S \circ R) = (T \circ S) \circ R$.