Izpit

25. januar 2017

Ime in priimek: ______________________ Vpisna št.: | | | | | | | | |

Študijski program: ______________________ Letnik: ______________

1. (20 točk) Prove $A \times (B \backslash C) = (A \times B) \backslash (A \times C)$.

2. (12 točk) Determine whether the following statements are true or false

(a) If f is a surjective function then f^{-1} is a function. YES NO

(b) If R linearly orders S then R is reflexive. YES NO

(c) If f is an injective function and g is a surjective function then $g \circ f$ is surjective. YES NO

(d) $\mathcal{P}(A) \cup \mathcal{P}(B) = \mathcal{P}(A \cup B)$. YES NO

3. (12 točk) Draw the diagrams for the following categories.

a. Category $\mathbb{A}$: Objects A,B,C,D , Maps: 1_A, 1_B, 1_C, 1_D $f : A \to C$, $g : B \to D$,$h : A \to D$,

b. Category $\mathbb{B}$: Objects: A,B,C,D,E, Maps: 1_A, 1_B, 1_C, 1_D, 1_E $f : A \to B$, $g : B \to A$, $h : C \to D$, $h : D \to E$,

c. Is $G : \mathbb{A} \to \mathbb{B}$ a functor (explain your answer)

- $F(A) = C$
- $F(B) = D$
- $F(C) = D$
- $F(D) = F$

d. Is $F : \mathbb{B} \to \mathbb{A}$ a functor (explain your answer)

- $F(A) = A$
- $F(B) = A$
- $F(C) = B$
- $F(D) = D$
- $F(E) = C$

4. (16 točk) Draw the following Venn diagrams

a. $A \cap B \neq \emptyset, B \cap C \neq \emptyset, A \cap C = \emptyset$

b. $A \subseteq B \subseteq C$

c. $A \subseteq B$, mark $\bar{A} \cap B$

d. $A \cap B \cap C \neq \emptyset$, mark $A \cup B \cup C \backslash (A \cap B \cap C)$,

5. (20 točk) For arbitrary sets E and F show that $f(E \cap F) \subseteq f(E) \cap f(F)$

6.(16 točk) Write down the compositum of the following relations, write down the image of the compositum and determine whether it is injective, surjective or bijective. Finally, write doen the given preimage.

a. $\mathcal{R}_1 = \{(1,3),(2,3),(3,1),(4,2)\}$, $\mathcal{R}_2 = \{(1,2),(2,3),(3,2),(4,4)\}$, $f = \mathcal{R}_2 \circ \mathcal{R}_1 =?$, $f^{-1}(\{1,2\})$

b. $\mathcal{R}_1 = \{(1,2),(2,4),(3,3),(4,2)\}$, $\mathcal{R}_2 = \{(1,2),(2,4),(3,3),(4,2)\}$, $f = \mathcal{R}_2 \circ \mathcal{R}_1 =?$, $f^{-1}(\{4\})$

c. $\mathcal{R}_1 = \{(1,2),(2,4),(3,1),(4,3)\}$, $f = \mathcal{R}_1 \circ \mathcal{R}_1 =?$, $f^{-1}(\{4\})$

d. $f : \mathbb{Z}^+ \to \mathbb{Z}^+$, $f(x) = x^x$, $g = f \circ f?$, $f^{-1}(\{1\})$

7. (20 točk) For the set $S = \{1,2,3,4,5,6\}$ we have the relation

$$xRy \Leftrightarrow x + y = odd \qquad \text{in} \qquad y \leq x$$

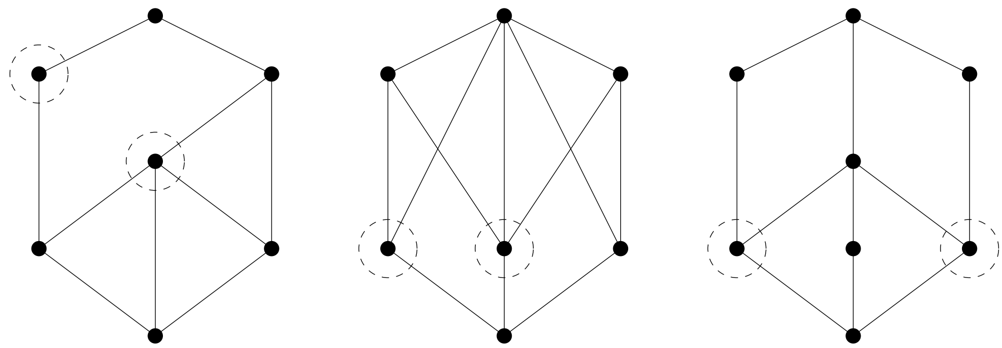
a. Draw the Hasse diagram for R

b. List all the R-minimal elements

c. List all the R-maximal elements

d. Does the relation $x \cdot y = even \quad y \leq x$ order S?

8.(12 točk) Mark the infimum in supremenum for the two elements in the following Hasse diagrams or write that it does not exist. Determine whether it repesents a net.



9.(16 točk) How many possible maps, $f : A \to B$ are there between the given sets

a. $A = \{0,1,2\}$, $B = \{0,1,2\}$

b. $A = \{0,1,2,3\}$, $B = \{1,2\}$

c. $A = \{0,2\}$, $B = \{1,2,3\}$

d. How many injective functions are there in b.)?