Jack Bianca

Graded Homework 3

∈ ⊆ ⊂ ∩ ∪ R ∅ U

1. Let S = {2, 4, {3, 4}, 5, {6}, 8} be a set.
   (a) Mark true or false for each of the following:
   i. {2}∈S
   ii. {2}⊂S
   iii. {6}∈S
   iv. {6}⊂S
   v. {{3, 4}}⊂S
   (b) Give a partition of S.

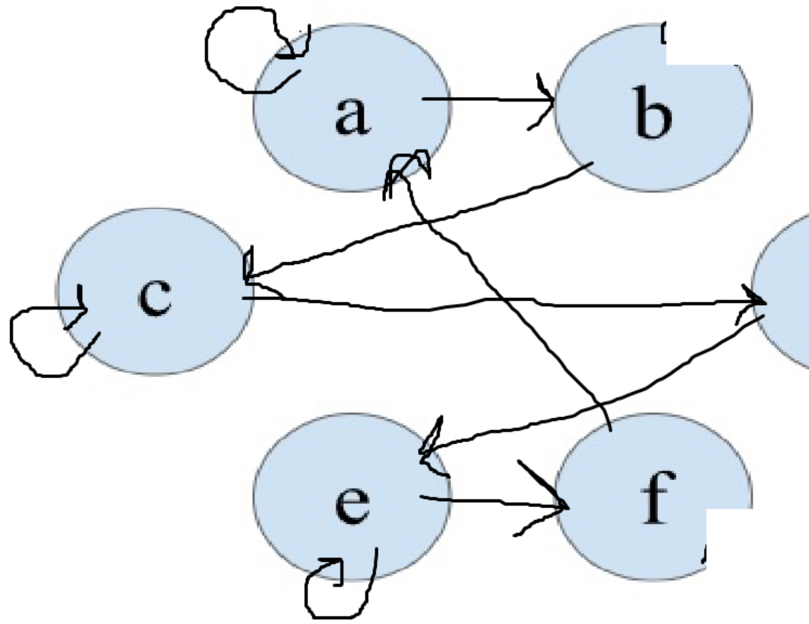
A. i. true
   ii. false
   iii. false
   iv. true
   v. true

b. S1 = {2,4,5,8}
   S2 = {3,4}
   S3 = {6}

2. Let f be a function from the set A to the set B.
   (a) Say that the size of A is 6 and the size of B is 10. Is it possible to for f to be onto? Is it possible for f to be one-to-one? Why or why not?
   (b) Say that the size of A is 8 and the size of B is 5. Is it possible to for f to be onto? Is it possible
   for f to be one-to-one? Why or why not?
   (c) If we know that f is a bijection, what can we assume about the size of A and the size of B?

a) No, it is not possible for f to be onto. Yes, it is possible for f to be one-to-one. It cant be onto because not every element of A can map to every element of B. It can be one-to-one because every element of A can map to some element of B.
b) It is possible for f to be onto, but it cannot be one-to-one. Every element of A can map to some element of B, but its not one-to-one because not every element of A has an exclusive B.
c) We can assume that set A and set B have the same size, because every A would have to map to exactly one B

3. Let X = {a, b, c, d, e, f } be a set. Create a binary relation on X that is reflexive and antisymmetric.
Represent your relation as a matrix and a digraph.



	A	B	C	D	E	F
A	1	1	0	0	0	0
B	0	0	1	0	0	0
C	0	0	1	1	0	0
D	0	0	0	1	1	0
E	0	0	0	0	1	1
F	1	0	0	0	0	0

4. Let Z = {a, b, c, d, e, f, g, h, i, j} be a set, and define a relation on Z as b > a if and only if b is after a
   in the English alphabet. The English alphabet, in order, is included below for your reference.
   Find the minimal and maximal elements of the poset (Z, >).

Min(Z) = j

Max(Z) = a

5. Determine if the following relation is an equivalence relation: x and y are integers and xRy if $x-y = 3m$
for some integer m. Justify your reasoning.

Yes this would be an equivalence relation,

Reflexive: xRx is true because if x-x=0 and 0 is divisible by all numbers including 3

Symmetric: yRx is true because y-x = -3m, which is also divisible by 3

And Transitive: if you let y-z = 3k where k is an integer and you add the equations together you will get

x-z = 3(m+k) = xRz, which proves its transitive.