Discrete Math 2 HW 2

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Problem 9.5.22.

It is an equivalence relation

Problem 9.5.24. a-c

a. No b. Yes c. Yes

Problem 9.5.16.

Reflexive proof:
1. Let a,d be positive integers
2. ad=da
3. ad=ad (commutative)

Symmetric proof:
1. Assume (a,b) related to (c,d) and a,b,c,d are positive integers
2. ad=bc (definition for relation)
3. cb=ad (algebra)

Transitive proof:
1. Assume (a,b) related to (c,d) and (c,d) related to (e, f) and a,b,c,d,e,f are positive integers
2. ad=bc (definition of relation)
3. cf=de (definition of relation)
4. $\frac{a}{b} = \frac{c}{d}$
5. $\frac{c}{d} = \frac{e}{f}$
6. $\frac{a}{b} = \frac{e}{f}$
7. af=be (algebra)

Problem 9.5.40.

a. $\{c, d \in \mathbb{Z}^+ | d = 2c\}$

Problem Let R and S be relations on the set....

a. {(a, b),(b, d),(c, b),(d, e),(d, f),(a, a),(b, b),(c, c),(d, d),(e, e),(f, f)}
b. {(a, b),(b, d),(c, b),(d, e),(d, f),(b, a),(d, b),(b, c),(e, d),(f,d)}
c. {(a, b),(b, d),(c, b),(d, e),(d, f),(b, f),(b, e),(c, d),(c, e),(c, f),(a, d),(a, f),(a, e)}
d. {(b, a),(b, c),(d, b),(d, d),(e, b),(f, d),(b, b),(a, a),(c, c),(e, e),(f, f)}
e. {(b, a),(b, c),(d, b),(d, d),(e, b),(f, d),(a, b),(b, e),(c, b),(b, d),(d, f)}
f. {(b, a),(b, c),(d, b),(d, d),(e, b),(f, d),(d, a),(e, a),(e, c),(d, c),(f, c),(f, b),(f, a)}

Assume R is reflexive, anti-symmetric, and transitive. When creating the symmetric closure, we keep it's reflexive and transitive properties, and add on symmetric. Therefore the reflexive closure has the properties reflexive, symmetric, and transitive because it has all those properties it is an equivalence relation.