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CSIS 213-3941

Assignment 12 Quiz 9 Pt 2

**Question 4**

A relation S is defined on the set of integers as follows: For all (a, b) ∈ Z, a S b ⇔ 19 | (a3 – b3).

Is S an equivalence relation? Write a mathematical proof to support your answer.

**Proof:**

Suppose a and b are [particular but arbitrarily chosen] integers. Because 19 is prime, the only possible integers that satisfy the relation are: 1, -1, 19, -19. Thus (a3 – b3) must equal one of the four possible integers. Because the possible integers are all odd, a must be greater than b. Thus,

**S is not symmetric:** If a > b then (a3 – b3) will not equal (b3 – a3) because (a3 – b3) > (b3 – a3).

Therefore,

**S is not an equivalence relation:** S is not symmetric and an equivalence relation must be reflexive, transitive, **and** symmentric.