9.5 Equivalence Relations

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Which of these relations on $\{0, 1, 2, 3\}$ are equivalence relations? Determine the properties of an equivalence relation that the others lack.

a) $\{(0,0), (1,1), (2,2), (3,3)\}$

b) $\{(0,0), (0,2), (2,0), (2,2), (2,3), (3,2)(3,3)\}$

c) $\{(0,0), (1,1), (1,2), (2,1), (2,2), (3,3)\}$

d) $\{(0,0), (1,1), (1,3), (2,2), (2,3), (3,1), (3,2), (3,3)\}$

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Suppose that A is a nonempty set, and f is a function that has A as its domain. Let R be the relation on A consisting of all ordered pairs (x, y) such that $f(x) = f(y)$. Show that R is an equivalence relation on A.
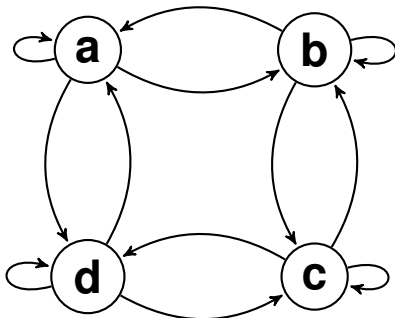
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Determine whether the relation with the directed graph shown is an equivalence relation.
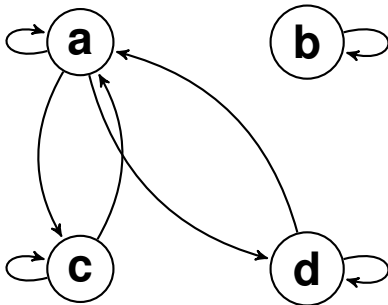
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Determine whether the relation with the directed graph shown is an equivalence relation.

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What is the congruence class $[n]_5$ (that is, the equivalence class of n with respect to congruence modulo 5) when n is

a) 2?

b) 3?

c) 6?

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Which of these collections of subsets are partitions of $\{1, 2, 3, 4, 5, 6\}$?

a) $\{1, 2\}, \{2, 3, 4\}, \{4, 5, 6\}$

b) $\{1\}, \{2, 3, 6\}, \{4\}, \{5\}$

c) $\{2, 4, 6\}, \{1, 3, 5\}$

d) $\{1, 4, 5\}, \{2, 6\}$

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List the ordered pairs in the equivalence relations produced by these partitions of $\{0, 1, 2, 3, 4, 5\}$.

a) $\{0\}, \{1, 2\}, \{3, 4, 5\}$

b) $\{0, 1\}, \{2, 3\}, \{4, 5\}$

c) $\{0, 1, 2\}, \{3, 4, 5\}$