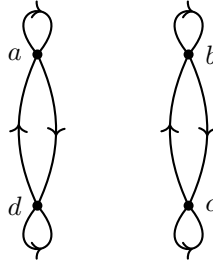


Problem §9.5 - 3(c,d,e): Which of these relations on the set of all functions from \mathbb{Z} to \mathbb{Z} are equivalence relations? Determine the properties of an equivalence relation that the others lack.

- (c) $\{(f, g) : f(x) - g(x) = 1 \text{ for all } x \in \mathbb{Z}\}$.
- (d) $\{(f, g) : \text{for some } C \in \mathbb{Z}, \text{ for all } x \in \mathbb{Z}, f(x) - g(x) = C\}$.
- (e) $\{(f, g) \mid f(0) = g(1) \text{ and } f(1) = g(0)\}$.

Problem §9.5 - 22: Determine whether the relation with the directed graph shown is an equivalence relation.



Problem §9.5 - 24(a,b): Determine whether the relations represented by these binary matrices are equivalence relations.

(a)
$$\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

(b)
$$\begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$

Problem §9.5 - 30(a,b): What are the equivalence classes of these bit strings for the equivalence relation

$$R = \{(x, y) : x \text{ and } y \text{ are binary strings of length three or more that agree in the first three bits}\}$$

- (a) 010
- (b) 1011

Problem §9.5 - 44(a,b,e): Which of these collections of subsets are partitions of the set of integers?

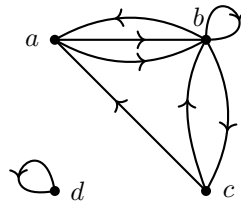
- (a) the set of even integers and the set of odd integers.
- (b) the set of positive integers and the set of negative integers.
- (e) the set of integers not divisible by 3, the set of even integers, and the set of integers that leave a remainder of 3 when divided by 6.

Problem §9.5 - 48(a): List the ordered pairs in the equivalence relation produced by the following partition of $\{a, b, c, d, e, f, g\}$:

$$\{a, b\}, \{c, d\}, \{e, f, g\}$$

Problem §10.1 - 28: Describe a graph model that represents a subway system in a large city. Should edges be directed or undirected? Should multiple edges be allowed? Should loops be allowed?

Problem §10.2 - 8: Determine the number of vertices and edges and find the in-degree and out-degree of each vertex for the following graph:



Problem §10.2 - 10: For the graph in Problem §10.2–8, determine the sum of the in-degrees of the vertices and the sum of the out-degrees of the vertices directly. Show that they are both equal to the number of edges in the graph.

Problem §10.2 - 35(a,b,c): How many vertices and how many edges do these graphs have?

- (a) K_n .
- (b) C_n .
- (c) W_n .

Problem §10.2 - 37(a,b,c): Find the degree sequence of each of the following graphs.

- (a) K_4 .
- (b) C_4 .
- (c) W_4 .