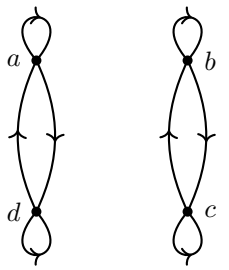
Problem §9.5 - 3(c,d,e): Which of these relations on the set of all functions from $\mathbb{Z}$ to $\mathbb{Z}$ are equivalence relations? Determine the properties of an equivalence relation that the others lack.

(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.

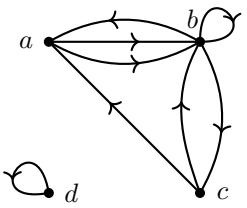
(e) the set of integers not divisible by 3, the set of even integers, and the set of integers that leave a remainder of 3 when divided by 6.

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-degree 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.