Algorithm Design

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Solution of Exercise C-7.11

1. If $M^2(i,j) = 1$, then there is a path of length 2 (a path traversing exactly 2 edges) from vertex i to vertex j in the graph G. Alternatively, if $M^2(i,j) = 0$, then there is no such path.
2. Similarly, if $M^4(i,j) = 1$, then there exists a path of length 4 from v_i to v_j, otherwise no such path exists. The situation with M^5 is analogous to that of M^4 and M^2. In general, M^p gives us all the vertex pairs of G which are connected by paths of length p.
3. if $M^2(i,j) = k$, then we can conclude that the shortest path connecting vertices i and j of length ≤ 2 has weight k. That is, if $k = \infty$, then i and j are not connected with a path of length at most 2, and, if $k \neq \infty$, then they are connected with a path of length at most 2 that has weight k and is a shortest path of length ≤ 2.