1. For each of the following parts, draw an arbitrary graph on 5 vertices satisfying the specified properties, and give both its adjacency list and adjacency matrix representations.
   (a) A complete undirected graph.
   (b) A complete directed graph.
   (c) An undirected cycle graph (note that a cycle graph is a connected graph in which every vertex has degree exactly 2).
   (d) A directed cycle graph.
   (e) A binary tree, with the edges oriented from parent to child.
   (f) An undirected graph, with two connected components, respectively, with $2, 3$ vertices.

2. Given a graph G with m edges, show that
   (a) the adjacency matrix representation of G contains exactly $2m$ 1s.
   (b) the adjacency list representation of G contains exactly $2m$ linked list nodes.

3. For each of the following questions, write a function to perform the specified operation on a graph G, represented using an adjacency matrix. For each of the functions, give the best bound you can on their worst case asymptotic complexity.
   (a) Compute the degree of the node that has the most neighbors.
   (b) Check if G is an empty graph.
   (c) Check if (u, v) is in $E(G)$, where $u, v \in V(G)$.
   (d) Check if the graph contains a triangle. A *triangle* is a set of three vertices such that the induced subgraph formed by them is complete.
   (e) Add an edge (u, v) to $E(G)$, where $u, v \in V(G)$.
   (f) Delete the edge $(u, v) \in E(G)$.
   (g) Subdivide the edge $(u, v) \in E(G)$. The *subdivide* operation introduces a new vertex w such that the resultant graph contains edges $(u, w), (w, v)$ instead of the edge (u, v).
   (h) Output the complement of the graph. The *complement* of a graph $G(V, E)$ is the graph $G'(V, E')$, where $E' = \{(u, v) : (u, v) \notin E \text{ and } u \neq v\}$.
   (i) Check if the graph is *Eulerian*. A graph is Eulerian if it contains a circuit that passes through every edge.

4. Repeat each part of the preceding question assuming that the graph G is represented using adjacency lists.

5. Question 22.1-6 in CLRS.