ASSIGNEMENT 3:

IFT 2015: Data Structures

Name: Gbian Bio Samir

Identifier: 20250793

1. Auto evaluation

   The code works perfectly. But the edges are not displayed in the same order as in the examples. However, the edges and the final weight are the same as the ones in the examples.

2. Time complexity analysis

```
public static List<Edge> primJarnik(Graph graph) {
    int numVertices = graph.getNumVertices();
    boolean[] visited = new boolean[numVertices];
    List<Edge> mst = new ArrayList<>();
    PriorityQueue<Edge> priorityQueue = new PriorityQueue<>();
    int initialVertex = 0;
    visited[initialVertex] = true;
    priorityQueue.addAll(graph.getAdjacentEdges(initialVertex)); //O(|E|)
    while (!priorityQueue.isEmpty()) {
        Edge currentEdge = priorityQueue.poll(); //O(|E| log |E|)
        int destination = currentEdge.getDestination().getKey();
        if (visited[destination]) {
            continue;
        }
        visited[destination] = true;
        mst.add(currentEdge);

        graph.getAdjacentEdges(destination).forEach(edge -> { //O(|V|)
            if (!visited[edge.getDestination().getKey()]) {
                priorityQueue.add(edge); //O(|E| log |E|)
            }
        });
    }

    return mst;
}
```

Overall, the algorithm is **O ((|V| + |E|) log |E|)** in the worst case.