

ASSIGNMENT 1

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1. [10 marks] Consider L_1 shortest paths in a polygon/polygonal domain.
 - (a) Give an example to show that in a polygonal domain, the shortest L_1 path from s to t may be different from the Euclidean shortest path from s to t . (“Euclidean” means the usual L_2 metric.)
 - (b) Argue that in a simple polygon, the Euclidean shortest path is ~~equal to the~~ an L_1 shortest path.
2. [10 marks] In a directed graph, *turn penalties* are non-negative weights assigned to pairs of edges of the form $(x, y), (y, z)$ —i.e. an edge entering some vertex y followed by an edge leaving y . Let G be a directed graph with non-negative edge weights w and non-negative turn penalties t . The *length* of a path is the sum of the weights of the edges in the path plus the sum of the turn penalties of consecutive pairs of edges in the path.

Give an algorithm to find the shortest path from vertex a to vertex b in G under this measure, and analyze the running time in terms of n , the number of vertices, and m , the number of edges. (You may use algorithms from class.)