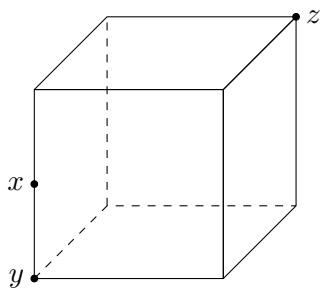
Shortest Paths on Polyhedra

MATH 261 Computational Geometry

1. Consider a unit cube:



(a) What is the shortest path on the surface of the cube from x to z?

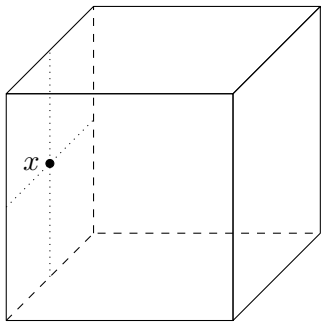
(b) What is the shortest path on the surface of the cube from y to z?

(c) Does the shortest path between any two points ever touch the interior of 4 or more faces of the cube?

(d) Does the shortest path ever go through a vertex?

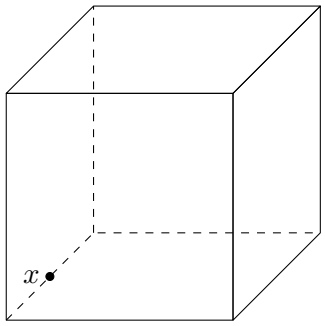
2. How many ways are there to unfold a cube?

3. (a) Place a point x in the middle of one face of the cube, as shown below. Find the set of points on the surface of the cube that have *more* than one shortest path to x.



(b) If you cut the cube along the set of points you identified in part (a), can you unfold the cube? Sketch the general net that results.

4. (a) Place a point x in the middle of one edge of the cube, as shown below. Find the set of points on the surface of the cube that have *more* than one shortest path to x.



(b) If you cut the cube along the set of points you identified in part (a), can you unfold the cube? Sketch the general net that results.