

1. Add  $\frac{1}{2^n}$  to every edge. This will penalize longer paths without raising their length to the next integer value since the shortest path is guaranteed to be length  $n$  or less.
2. (a) Add a condition to the while loop so it only runs  $K$  times.  
 (b)  $O(dK \log K)$
3. (a) Run Dijkstra's once on  $u$  and once on  $v$ . ( $O((m+n) \log n)$ )  
 (b) Loop through every node, finding the one that minimizes  $\max(\text{dist}(u, w), \text{dist}(v, w))$ . ( $O(n)$ )