



# Reductions



0/3 points earned (0%)

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Review the material and try again! You have 3 attempts every 8 hours.

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0 / 1  
points

1.  
(seed = 489125)

Which of the following problems can be linear-time reduced *to* the standard shortest-paths problem in digraphs with nonnegative weights? Check all that apply.



Given a digraph with positive edge weights and two *sets* of vertices  $S$  and  $T$ , find a shortest path from any vertex in  $S$  to any vertex in  $T$ .



This should be selected



Given a digraph with positive edge weights and a vertex  $s$ , find the shortest simple cycle that contains  $s$ .



This should be selected



Given an undirected graph with arbitrary edge weights, find a negative cycle.



Un-selected is correct



Given an undirected graph and two vertices  $s$  and  $t$ , among all paths between  $s$  and  $t$ , find one that uses the fewest edges.



Correct



Given a digraph and two vertices  $s$  and  $t$ , find a path from  $s$  to  $t$  that uses the fewest edges.



Correct



0 / 1  
points

2.

(seed = 511394)

Which problems are known to have the same asymptotic complexity as sorting an array of  $N$  real numbers? Assume the quadratic decision tree model of computation. Check all that apply.



Given an array of  $N$  real numbers, determine if any two are equal.



Correct



Given a sorted array of  $N$  real numbers, determine if any two sum to zero.



This should not be selected



Given two arrays of  $N$  real numbers, is one a permutation of the other (i.e., they contain exactly the same multiset of numbers)?



Correct



Given  $N$  points in the plane, find all sets of 3 or more points that are collinear.



This should not be selected



Given an array of  $N$  real numbers, find one that occurs more than  $N/10$  times.



Un-selected is correct

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0 / 1  
points

3.

(seed = 686011)

Suppose that 3-SUM has a  $N^{3/2}$  lower bound and that 3-SUM linear-time reduces to 3-COLLINEAR. Which of the following can you infer? Check all that apply.



If 3-COLLINEAR can be solved in  $N^{3/2}$  time, then so can 3-SUM.



Correct



3-SUM can be solved in  $N^{3/2}$  time.



Un-selected is correct



If 3-COLLINEAR cannot be solved in  $N^{5/3}$  time, then neither can 3-SUM.



This should not be selected



3-COLLINEAR cannot be solved in  $N^{5/4}$  time.



Correct



If 3-SUM can be solved in  $N^{3/2}$  time, then so can 3-COLLINEAR.



This should not be selected

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