

Interview Questions: Reductions

3/3 points earned (100%)

Excellent!

Retake

Course Home



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points

1.

Longest path and longest cycle. Consider the following two problems

- *LongestPath*: Given an undirected graph G and two distinct vertices s and t , find a simple path (no repeated vertices) between s and t with the most edges.
- *LongestCycle*: Given an undirected graph G' , find a simple cycle (no repeated vertices or edges except the first and last vertex) with the most edges.

Show that *LongestPath* linear-time reduces to *LongestCycle*.

A



Thank you for your response.

Hint: add a new path (with new vertices) between s and t .



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points

2.

3Sum and 4Sum. Consider the following two problems:

- *3Sum*: Given an integer array a , are there three distinct indices i, j , and k such that $a_i + a_j + a_k = 0$?
- *4Sum*: Given an integer array b , are there four distinct integers i, j, k , and ℓ such that $b_i + b_j + b_k + b_\ell = 0$?

Show that *3Sum* linear-time reduces to *4Sum*.

A

Thank you for your response.

Hint: define $M = 1 + \max_i |a_i|$. To solve an instance of *3Sum* with N integers, form an instance of *4Sum* with $N + 1$ integers containing only one negative value ($-3M$).



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points

3.

3Sum and 3Linear. Consider the following two problems:

- *3Linear*: Given an integer array a , are there three indices (not necessarily distinct) i, j , and k such that $a_i + a_j = 8 a_k$?
- *3Sum*: Given an integer array b , are there three indices (not necessarily distinct) i, j , and k such that $b_i + b_j + b_k = 0$?

Show that *3Linear* linear-time reduces to *3Sum*.

A

Thank you for your response.

Hint: define $M = 1 + \max_i |a_i|$. To solve an instance of *3Linear* with n integers, form an instance of *3Sum* with $2n$ integers.

