## Interview Questions: Reductions

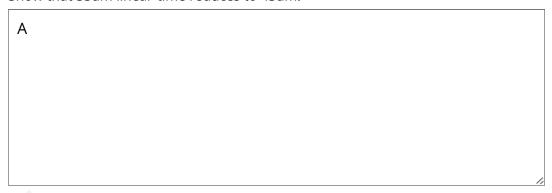
THET VIEW QUESTIONS. REductions					
<b>3/3</b> points earned (100%)					
Excellent!					
Retake  Course Home					
1/1 points					
1. <b>Longest path and longest cycle.</b> Consider the following two problems					
• LongestPath: Given an undirected graph $G$ and two distinct vertices $s$ and $t$ , find a simple path (no repeated vertices) between $s$ and $t$ with the most edges.					
ullet 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 <i>LongestPath</i> linear-time reduces to <i>LongestCycle</i> .					
A					
Thank you for your response. Hint: add a new path (with new vertices) between $s$ and $t$ .					

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  $\ell$  such that  $b_i + b_j + b_k + b_\ell = 0$ ?

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



## 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).



1/1 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  $a_i + a_i = 8 a_k$ ?
- *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.

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## 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.

