CS340 => Assignment 6

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Problem 1)

□ => Pivot _ => Swap
i from left, j from right.

20	13	17	25	18	2	29	14	8	
20	13	17	25	8	2	29	14	$\boxed{18}$	Pivot is 18
14	13	17	25	8	2	29	20	$\boxed{18}$	
14	13	17	2	8	25	29	20	$\boxed{18}$	
14	13	17	2	8	$\boxed{18}$	29	20	25	Pivot is 14, and 25
8	13	17	2	$\boxed{14}$	18	29	20	$\boxed{25}$	
8	13	2	17	$\boxed{14}$	18	20	29	$\boxed{25}$	
8	13	2	$\boxed{14}$	17	18	20	$\boxed{25}$	29	Pivot is 8
2	13	$\boxed{8}$	$\boxed{14}$	17	$\boxed{18}$	20	25	29	
2	$\boxed{8}$	13	$\boxed{14}$	17	$\boxed{18}$	20	$\boxed{25}$	29	← Sorted

Problem 2)

A	B	C	D	E	F	G	H	I	S	t
2	1	3	2	4	2	1	1	2	$\boxed{0}$	3
2	1	3	2	4	2	$\boxed{1}$	1	2		3
2	1	3	$\boxed{2}$	4	2		$\boxed{1}$	2		3
2	1	3	$\boxed{2}$	4	2			2		3
$\boxed{2}$	1	3		4	2			2		3
	$\boxed{1}$	3		4	2			2		3
		3		$\boxed{4}$	2			2		3
		3			2			$\boxed{2}$		3
		3			$\boxed{2}$					3
		$\boxed{3}$								3
										$\boxed{3}$

$\boxed{\text{SGHDABEIFCt}}$

Problem 3)

1) if G has no cycle, then g has no topological order.

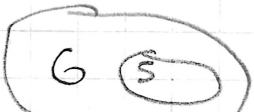
assume Graph G (and has a cyclet) has topological order, $[V_1, V_2, V_3, V_4, \ldots V_{99}]$ in addition assume there is a path between two vertices any of them, for example V_i ($=V_1$) and V_j ($=V_2$) with a path V_i to V_j then we would have a topological order and $i < j$. (i is start, j is end) By the cycle propert there would also be a path V_j to V_i since a cycle can go both ways. Therefore the topological order would be $j < i$ (j is the start, i is the end) Since a topological order is constant we see both directisons condradict each other, -> meaning a graph with a cycle cannot have a topological order.

*all paths have order

2) if G has no topological order, then g is a cycle.

if graph G has no topological order then there has to be some subgraph (S) of G where all vertices have 1 or more indegrees, (no terminating vertex) If there is a terminating one then we can prode a topological order. Let $[V_1, V_2 \ldots V_{aa}]$ be vertexes in this subgraph, for each vertex there must be a predecesor if there is no terminating one.

$$\underbrace{V_{\#} \ldots V_{-4} \longrightarrow V_{-3} \longrightarrow V_{-2} \longleftrightarrow V_{-1} \longrightarrow V \longrightarrow V_{\#}}$$



if this path continues the length would be V+1 at the least.

*Due to us not having unlimited vertices one must repea

therefore since each must have a predecessor therefore there must be at least 1 vertex repeated in the chain at somepoint. This creats a cycle withing the subgraph. Therefore G also has that cycle.

* all nodes will be a 'child' and a parent due to not having a toplogical order.

↑ Note.

Problem 4)

(a) Pivots : first, middle, last, medium of 3. → 4
Cutoffs : no, 5, 10, 20 (less than or equal) → 4

* 16 different algorithms

(b) 3 different lists (increasing, random, decreasing)

16 · 3 = 48 runs!

Comparison table Example

	Algorithm	[0-99] Increasing	[Random] Random	[99-0] Decreasing
No cut off	First	4950	596	4852
	Middle	483	619	514
	Second	2549	664	2990
	Medium	606	636	774
5 cut off	First	4950	670	4861
	Middle	536	679	614
	Second	2551	735	2993
	Medium	579	655	786
10 cut of	First	4930	796	4888
	Middle	544	809	718
	Second	2545	837	3026
	Medium	542	784	1114
20 cut off	First	4815	1062	5023
	Middle	501	1110	1093
	Second	2495	1179	3197
	Medium	473	1141	1926

* You can run my code it will autogenerate another set of results.