

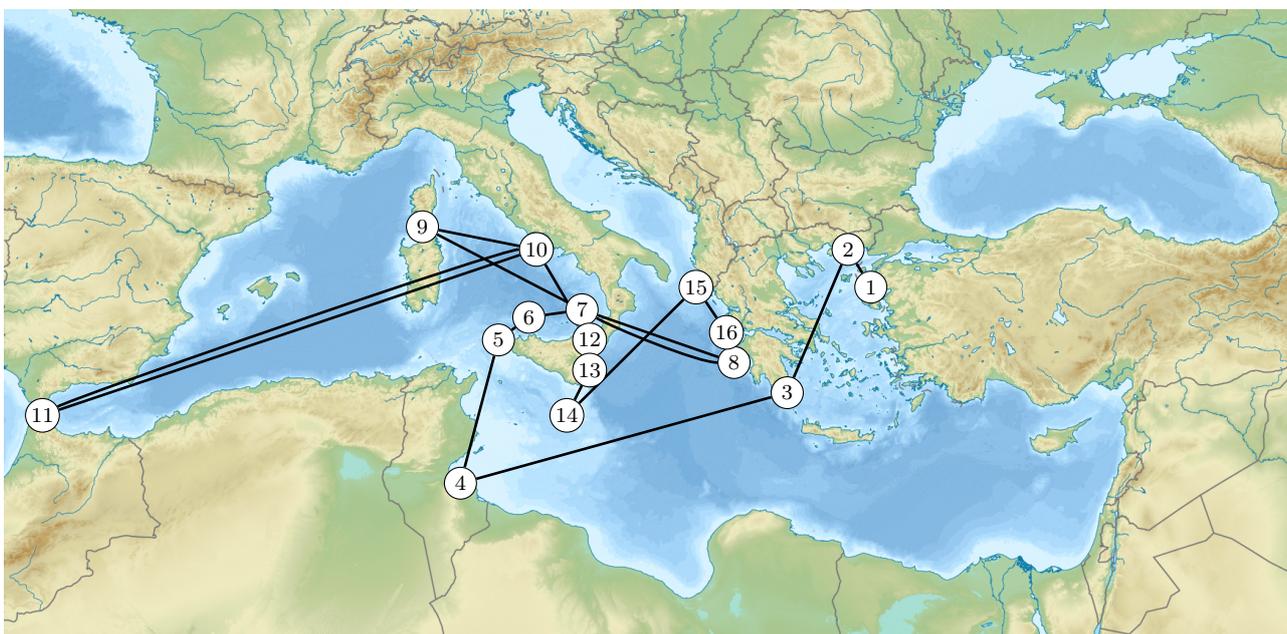
# Problem Set 1

due: October 21, 2019

## Exercise 1

10 points

### An Optimization Odyssey



1 Troy	5 Goat Island	9 Laestrygonians	13 Thrinakia
2 Ismaros	6 Cyclopes	10 Circe	14 Ogygia
3 Cape Malea	7 Island of Aeolus	11 Pillars of Hercules	15 Scheria
4 Lotus Eaters	8 Zakynthos	12 Scylla and Charybdis	16 Ithaca

(a) Following Homer's *Odyssey*, Odysseus took the route

$$1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 7 - 9 - 10 - 11 - 10 - 12 - 13 - 14 - 15 - 16$$

from Troy to Ithaca. According to the distance table on the back, how long is this route?

- (b) What is the number of paths from Troy to Ithaca visiting each of the stops 1-16 exactly once?
- (c) Eurylochus, second in command on Odysseus' ship, has the following idea: Starting from Troy, he suggests to visit next the unvisited stop (2-15) which is closest to the current stop, before finally sailing to Ithaca. This gives a path as in (b). What is the length of Eurylochus' path?
- (d) Find a path as in (b) of length  $< 7000$  km! What is the shortest such path you are able to find? (No need to prove optimality.)

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	126	474	1526	1226	1133	958	532	1449	1122	2789	941	978	1127	542	509
2		541	1516	1184	1084	913	536	1371	1045	2728	904	946	1115	499	501
3			1157	980	919	751	271	1333	1029	2553	704	720	783	455	312
4				478	583	677	996	858	855	1504	651	600	401	1033	1019
5					115	271	740	470	379	1581	289	261	308	687	736
6						177	667	455	288	1661	216	207	343	592	656
7							493	591	333	1838	68	105	336	417	479
8								1066	759	2320	454	479	598	206	60
9									328	1387	650	656	776	933	1039
10										1697	400	427	622	610	726
11											1868	1841	1789	2248	2314
12												52	287	406	448
13													237	449	479
14														636	619
15															150

Distance [km]

Source: Dimitris Alevras, Manfred Padberg. Linear Optimization and Extensions: Problems and Solutions. Universitext, Springer Berlin Heidelberg, 2001.

Image: Relief Map of Mediterranean Sea by Nzeemin, CC-BY-SA 4.0