MS&E 336/CS 366: Computational Social Choice
Win 2019-20, HW 2. Due 3/11/20, 1 pm

You can do the HW in groups of up to 3. Please type up the answers. If you find the solution elsewhere, you can read it and digest it, but you must then type up the solution in your words without repeatedly referring to the solution. If you have changed groups, you should do the first problem with your old group.

1. Finish the problems in HW1 that you did not submit. Also, resubmit the answer to problem 8 in the previous HW, but this time, make sure that the definition you are suggesting is your own, and quite different from the one in class. For example, you might focus on how individuals align on issues, as opposed to polarization on a single issue. Or how politician polarization might get measured. Don't resubmit problem 8 if you are confident you already meet the criteria set here.

2. You are given an allocation problem, with three resources and three agents. Agent 1's happiness is equal to the sum of the first two resources allocated to that agent, agent 2's happiness is the sum of the last two resources allocated to that agent, and agent 3's happiness is four times the sum of all three resources allocated to that agent.

   In addition, the first resource costs one Dollar per unit, the second costs 2 Dollars per unit, and the third costs 3 Dollars per unit, and the total amount of money that can be spent in acquiring these resources must be no more than 5 Dollars. Using Excel's solver add-in, or any programming language, find the envy-free solution that maximizes the sum of the square-roots of everyone's happiness. A solution must describe how much of each resource to obtain and how much of each resource to allocate to each user. Your solution must be general enough that I can substitute different numbers and still get the correct result. Allocations can not be negative.

   Email your code or spreadsheet and include directions on how to run it.