

MATH 19-02: HW 9

- (1) Go to the wikipedia page *United States House of Representatives elections in Nevada, 2012* and get the results from the four congressional races. Using just the general election Dem vs Repub head to head numbers, first find the values (V_1, V_2, V_3, V_4) , then compute \bar{V} , \bar{S} , V_{med} , and m_{\uparrow} . Using Theorem 1, what two points are guaranteed to be on the SV curve?

Draw the SV curve using uniform partisan swing (on graph paper) and check that those points are on there.

- (2) Same for Oregon 2016. For this one, give $(V_1, V_2, V_3, V_4, V_5)$, draw the SV curve, and compute MM and PB .

- (3) Of course, Oregon 2016 didn't have exactly equal turnout in its five districts. But suppose that it did, and create a table to compute the efficiency gap by calculating W^R and W^D district by district and statewide, as in the partisan metrics handout.

Compare your answer to the output of the simple formula from Theorem 2.

- (4) Theorem 2 says that if all districts have equal turnout, $EG = 2\bar{V} - \bar{S} - \frac{1}{2}$.

Solve for $EG = 0$ algebraically and plot that line on the SV plane. (Horizontal axis is V and vertical axis is S , as usual.) Next, solve for $EG = -.08$ and for $EG = .08$ and plot those lines. Using those, shade the region that corresponds to $-.08 \leq EG \leq .08$ on your seats-votes plot.

(5) Suppose one district has 100,000 voters, and everyone votes either D or R. What voting outcomes would result in (a) Democrats wasting all their votes; (b) Democrats and Republicans wasting an equal number of votes; (c) Republicans wasting twice as many votes as Democrats waste?

(6) It is hard to estimate the Dem vs Repub voting in 2016 Massachusetts congressional elections, because five out of nine of them had no Republican candidate! However, in the 2014 Senate race, the Democrat (Markey) got 1,285,736 votes and the Republican (Herr) got 789,378. Let's suppose that congressional preference by party is similar. All nine seats are currently all occupied by Democrats. What is the efficiency gap, and what can you conclude about gerrymandering in MA?

- (7) Suppose Republicans get 38% of the statewide vote in MA and we are drawing district lines for 9 Congressional districts. (a) If geography were no obstacle, what's the most and what's the least amount of Republican representation that would be possible? (b) Can you come up with vote shares by district that would have good scores for *PB*, *MM*, and *EG*?