MA 391 ASSIGNMENT # 3

Answers to problems may be handwritten.

(1) What is the minimum percentage of the popular vote needed to win the US presidential election? (Note: this question has a surprising answer because you're allowed to assume an extremely hypothetical case.)

(2) Suppose that the population of states A, B, and C are 54, 243, and 703, respectively, and 11 seats are to be apportioned. How would the seats be allocated according to the 4 methods: Hamilton's, Jefferson's, Adams', and Hill-Huntington.

(3) The 1820 census had the US population at 8,969,878 and the population of New York at 1,368,775. The house had 213 seats.
  (a) Using this data, calculate the standard divisor, New York's lower quota, and New York's upper quota.
  (b) In the 1822 apportionment, Jefferson's method was used with a modified divisor of 39,900. Find New York's modified quota and the number of seats New York was given. Explain how this example shows that Jefferson's method does not satisfy the quota rule.

(4) An apportionment method is said to be *monotone* if, whenever state A receives fewer seats than state B, A has smaller population than B.
  (a) Suppose that states A, B, C, and D have populations 3003, 400, 399, and 398, respectively, and there are 7 seats to be apportioned. Assuming an apportionment method that is monotone and satisfies the quota rule, find *all* possible apportionments. (In this problem, you do not know the method being used, so there is more than one possible apportionment. You should not assume that each state is guaranteed at least one seat.)
  (b) Suppose that A gains 1 person, B gains 1103, C loses 3 people, and D loses 1. Again, find *all* possible apportionments.
  (c) Expalin how this example demonstrates the population paradox.