MATH CAMP

Problem Set 1

1. S&B 3.9 a, c, e, f, and g, p. 57

2. The utility that a legislator obtains from a policy in a one-dimensional policy space is $U(x) = -a(x-i)^2$ where i is the legislator's ideal point and a is the salience of the issue. This utility function formalizes the idea that the farther the policy x is from the legislator's ideal policy i, the worse off the legislator is. As we will see later in the course, the larger a, the larger the effect that a given change in x has the legislator's utility, i.e., the issue is more salient. To make things more concrete, suppose $a = 2$ and $i = 60$.

   (a) Prove that the legislator's utility maximizing policy is $x = 60$.

   (b) Suppose that the constitution requires x to be in the range $x \in [70,80]$. What policy in this range maximizes the legislator's utility. Be sure to justify you answer.

3. The balance-of-power school in international relations argues that peace is most likely when there is a balance of power between states. By contrast, the preponderance-of-power school argues that that peace is *least* likely when there is a balance of power and is most likely when one side has a preponderance of power. Suppose that the analysis of a formal model yields the result that the probablilty of war in the model is

$$\pi = \frac{1}{4} - \left(p - \frac{1}{2} \right)^2$$

   where π is the probability of war and p is the distribution of power between states *1* and *2*. That is, p is the probability that *1* prevails in a war against *2*. There is a balance of power when $p = 1/2$. By contrast, *1* has a preponderance of power (in the extreme) when $p = 1$ and *2* has a preponderance of power when $p = 0$. Is the result of the formal analysis consistent with one of the two schools or neither? Be sure to explain your answer.