Problem Set #3

1. Find

We know that

So,

We divide this into two cases, where and :

When , which happens in cases, these are independent, so we just have since the expectation of the product of two independent variables is the product of the expectations.

When , which happens in n cases, we have

This will result in either if or if . Therefore, we have two cases for our answer. If :

If :

2. Find the plug-in estimate of :

Using the method given in our lecture notes:

3. Code is attached

4a. The representation of suggest that we would need the maximum value, since will occur when we have our max sample.

4b. To find the bias, we use

Using the hint:

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4c. To find we use the jackknife method:

We know that

So, we create some jackknife replications. For the first sample, we take out the first data point, so the estimate will be , since that will still be the maximum. This will be the case until the last jackknife sample, where will be the new maximum. Therefore,

4d. We have that

5a. To find the bias, we need to find the expected value of the estimator.

And = 1:

Therefore,

Using Taylor expansions:

Therefore, the assumption holds with

Rest of 5 is in code.