

1. Consider the following definite integral:

$$\int_{-2}^5 4e^{-0.2x^2} dx.$$

Find the exact value of this integral. Use the Monte Carlo method discussed in class to simulate this integral with 10,000 random numbers. Compute the average and standard deviation for 100 Monte Carlo simulations of this integral.

2. a. Perform two Monte Carlo simulations for the Schmitz and Kwak study of the Deaconesse Hospital, using their assumptions, for each of the cases with 4 and 5 operating rooms and having a patient load of 32 patients per day (which would be the case load with Sundays and some holidays off). You can simply use two sets of random numbers and apply the same set to both the 4 and 5 operating room cases. Determine the latest times that the operating rooms and recovery room are open. Find the average length of time that the operating rooms are open each day.

b. If you assume that the recovery room must be staffed at all times by at least 2 nurses and that each nurse can handle at most 3 patients, then if the nurses only work integer numbers of hours. Find the number of nursing hours that are required to staff the recovery room according to your simulations.

c. (Bonus) Run the simulations for 4 and 5 operating rooms 100 times and answer the questions above. Give the mean longest time for both the operating and recovery rooms, mean average time of operating rooms being used, and the mean number of hours that are needed for the nursing staff in the recovery room. Also, compute the standard deviation of all of this information.