HW 5

1) If the population standard deviation is 2.3 and we take a random sample of size 64, what is the standard error of the mean?

2) In random sampling from a given population, by how much would we have to increase the sample size in order to make the sample mean four times as reliable?

3) Suppose that daily returns on a portfolio are independent, with a mean of 0.03% and a standard deviation of 1%. What is the probability that the average daily return over the next 100 days will be between 0.2% and 0.3%?

4) Suppose we take a random sample of size $n=2$ from an infinite population consisting of 30% zeros and 70% ones, and let $\bar{x}$ denote the resulting sample mean.
   A) Find the mean $\mu$ and standard deviation $\sigma$ of the population. (These are the expected value and the square root of the variance for a random variable that takes the value zero with probability 0.3 and one with probability 0.7.)
   B) Give the sampling distribution of $\bar{x}$. (Note that $\bar{x}$ is a discrete random variable with three possible values, namely 0, 0.5 and 1.)
   C) Use the distribution of $\bar{x}$ to calculate the mean and standard deviation of $\bar{x}$, that is, $\mu_{\bar{x}}$ and $\sigma_{\bar{x}}$.
   D) Verify that $\mu_{\bar{x}} = \mu$ and that $\sigma_{\bar{x}} = \sigma / \sqrt{n}$.

5) If we throw $n$ dice where $n$ is large, why can we think of the distribution of the sum as being approximately normal?

6) Suppose that an auto factory has 10 assembly lines, operating independently. For each assembly line, the number of autos produced per day has a mean of 20 and a standard deviation of 3. What is the probability that 180 or fewer autos will be produced tomorrow?