Fundamentals of Data Analysis: Assignment #5

Deadline: 11/10/2003 (Monday)

Please post to the mailbox next to the IS management office (2nd floor of IS building)

1. **Assume that variable X obeys Normal distribution $N(\mu, \sigma^2)$. Give the probability density function of another variable Y, which satisfies Y = exp(X).**

2. **Prove that the variance of uniform random numbers within a range [0, 1] is 1/12, based on the definition of variance.**
   Hint: The expectation of a continuous variable can be calculated by an integral of the product of the variable and its probability density function.

3. **Perform the following numeral experiment. This is aiming to help you to understand the meaning of the central limit theorem.**
   a. **Generate pseudo-random numbers within the range [0, 1] 5000 times, and draw its histogram (set the rank width properly). Based on this result, check that the frequency distribution of the random numbers is almost uniform.**
   b. **Carry out the following procedure for *n* = 4, 16, 64 and 256, and discuss the results.**
      (1) **Repeat 1,000 times the operation to calculate the mean value of *n* random numbers.**
      (2) **Draw the histogram of the obtained "mean values".**
      (3) **Calculate the mean and variance of the "mean values".**

   （Remarks）
   * You can use any programming language to do this experiment.
   * Set the rank width of the histogram appropriately so that you can compare the results in different conditions.
   * Of course, you can examine the results in other cases by yourself.

4. **Please feel free to write your comments and requests on this lecture (if any).**