

## MAT 331 Homework Exercises, 13-17

**NOTE:** Each exercise is worth 10 points and can be turned in at any time before its “expiration date”. You can work on any number of problems per homework sheet (none to all, usually 2 to 3). However, at the end of the semester, we will expect you to have turned in at least 2/5 of the exercises assigned. If you do more, we will pick your best grades. If you do less, the missing grades will be counted as zeros. This will determine 20% of your final grade for the class.

If you don't like Maple as a programming tool, you can use C/C++, Java or Perl for any problem in this assignment. Submit the source code which can be compiled and executed. Comment your code.

**#13 (exp. 11/03)** Using Maple write a program that will print the first 50 prime numbers. Do not use built-in Maple functions related to prime numbers (i.e. *ithprime*, *isprime*, etc.).

**#14 (exp. 11/03)** Use Monte-Carlo method to estimate the area of a unit circle. Monte-Carlo method consists of the following: select randomly a point from the set

$$\{(x, y) \in \mathbb{R}^2 : |x| < 1, |y| < 1\}.$$

If a point  $(x, y)$  is inside the unit disk, then add it to set  $A$ , otherwise to set  $B$ . Repeat the process many times. The ratio of the number of points in  $A$  and  $B$  determines the area of the unit disk.

**#15 (exp. 11/03)** Repeat Monte-Carlo method for the volume of the unit sphere in  $\mathbb{R}^3$ . How many random points do you need to choose to achieve accuracy up to second decimal? (The last question doesn't require a precise answer).

**#16 (exp. 11/03)** Write the program that will print the number of seconds from January 1, 1970, till the deadline of this assignment.

**#17 (exp. 11/03)** Create a random one dimensional array of size 100. Write a program that sorts the array in ascending and then in descending order. Explain the algorithm that you used for sorting.