AUIS ENGR 244 (Engineering Computing), Assignment 2

Deadline:[1] March 12, 2018; Tutorial discussion: March 26, 2018

1) Write a program that creates a file with the name "university.dat" and the content "AUIS."

2) Write a method which, to a sufficient level of accuracy, computes and returns the value of

$$\sum_{k=0}^{\infty} \frac{(-x)^k}{(2k)!},$$

wherein floating-point arithmetics is used, and **double** *x* is the single argument of the method.[2] Make a statement on the reached level of accuracy; why do you believe that this is sufficient?

3) The arguments of the method given below are **passed by reference**. Explain how we can tell that this is the case, and write an equivalent method (i.e., with the same outcome for equivalent arguments) to which the arguments are instead **passed by value**.

```
public static double distance(double[ ] r1, double[ ] r2)  // compute distance between points in 3D space
{
  if( (r1.length != 3) || (r2.length != 3) )  // make sure that r1 and r2 contain three elements each
  {
    System.out.println("Error: Invalid argument array size.");  return 0.0;
  }

  double dx = r2[ 0 ] - r1[ 0 ];  double dy = r2[ 1 ] - r1[ 1 ];  double dz = r2[ 2 ] - r1[ 2 ];

  return Math.sqrt( dx*dx + dy*dy + dz*dz );  // Math.sqrt(k) returns the square root of k
}
```

4) In the first assignment, you wrote a method **boolean** isPrime(**int** *n*), or equivalent, which can be used to determine whether its argument is a prime number.

Use this method now to write another method, which takes a single string as its argument and returns the string consisting of all characters that have a non-prime index, i.e., a non-prime position in the String, where the first symbol has the index 0. The method, e.g., if it is given "EFGHIJKL" as its argument, should return "EFIK" as its return value; the characters 'G' (index 2), 'H' (index 3), 'J' (index 5), and 'L' (index 7) are discarded because they have prime indices.

5) Characterize the **return value** of the method **comp**; how does it depend on its arguments?

```
public static double expo(double x, int n, int k, double x_power_k, double k_factorial)
{
  if( (k < 0)  ||  (n < 0)  ||  (n < k) )  return 0.0;

  double contribution_k = x_power_k  / k_factorial;

  if(k == n) return contribution_k;
  else return contribution_k + expo(x, n, k+1, x * x_power_k, (k + 1.0) * k_factorial);
}
public static double comp(double x, int n)
{
  return expo(x, n, 0, 1.0, 1.0);
}
```

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1 *Submissions (paper only), as single work or done by groups of two people, can be handed in on Monday, Mar 12, at lecture time, or deposited in the mailbox (room B-F2-01) by* **Saturday, Mar 10**. *Each problem contributes one credit.*

2 *Do write the method yourself; do not use any built-in mathematical methods (i.e., use elementary arithmetics only).*