Homework #0 (aka Welcome Test)

Stat4DS2+DS (key: `tardella2017`)
https://elearning2.uniroma1.it/course/view.php?id=4951

deadline 27/02/2017 (8:30)

Your Last+First Name _____ **Your Matricola** _____

0. Do you know how to use an RMarkdown file to answer these questions with text and R code?

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```

1. Fix the *seed* to start the simulation of a single random variable from a (standard) uniform distribution on [0,1]. Use your *matricola* number as seed. Call the simulated value `lambda`

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2. Simulate 1000 random variables using the following code

```
X = runif(1000)
Y = - lambda * log(X)
```

and then plot the histogram of the simulated values using the option `freq=FALSE`.

3. Can you **prove** that the theoretical distribution of Y is exponential with rate equal to `1/lambda`? [explain or ... do it with all details!]

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4. Can you plot a graphical representation of the theoretical distribution?

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5. Can you tell what is the relation between the theoretical curve of the density of Y and the graph of the histogram?

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6. Suppose we have a random vector (Z, Y) Do you know what a joint density $f_{Z,Y}(z, y)$ is? What are the properties it must satisfy?

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7. Can you derive in formula the distribution of Z? How it is called?

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8. Conditionally on each simulated $Y_i = y_i$ (i=1,2,...,1000), simulate $Z_i = y_i * W_i$ where W_i has distribution standard Normal and is independent of Y_i. What is the conditional distribution of $Z|Y = y$?

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9. Can you provide a simulation from the marginal distribution of Z?

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10. Can you provide an approximation of the marginal distribution of Z? Please justify your answer.

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11. How could you derive/write the joint distribution of (Z, Y)?

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```
## This homework will be graded and it will be part of your final evaluation
##
##

## Last update by LT: Thu Feb 23 16:04:37 2017
```