Exercise 3

1. Generate simulated values from the following distributions
   (a) Exponential distribution
   (b) Normal distribution (at least with standard Box-Mueller)
   (c) Pareto distribution, with $\beta = 1$ and experiment with different values of k values: $k = 2.05$, $k = 2.5$, $k = 3$ and $k = 4$.

   Verify the results by comparing histograms with analytical results and perform tests for distribution type.
2. For the Pareto distribution with support on $[\beta, \infty[$ compare mean value and variance, with analytical results, which can be calculated as $\mathrm{E}(X) = \beta \frac{k}{k-1}$ (for $k > 1$) and $\mathrm{Var}(X) = \beta^2 \frac{k}{(k-1)^2(k-2)}$ (for $k > 2$). Explain problems if any.
3. For the normal distribution generate 100 95% confidence intervals for the mean and variance, each based on 10 observations. Discuss the results.
4. Simulate from the Pareto distribution using composition.