

Using ROOT and c++ programming language to write codes to finish the following exercises.

Exercise 1

- Using random number generator TRandom3 to generate 10 random numbers and print them out.
- Define a histogram using TH1D, with 100 bins, with a range from 0 to 1. Using the random number generator to generate 1000000 random numbers and fill inside this histogram. And then, draw the histogram.
- Define a 1-D function f1, $f(x) = 1/k \cdot e^{-x/k}$, for $0 < x < 10$, set parameter $k = 2$, and draw this function.
- Define another histogram using TH1D, with 100 bins and range from 0 to 10. Using Monte-Carlo method (with "throw away events" method), to generate the 1000000 events according to the function f1 defined above.

Exercise 2

- Define a function f1, $f(x) = a \cdot G(x; \mu_1, \sigma_1) + b \cdot G(x; \mu_2, \sigma_2)$, where $G(x)$ is Gaussian function. Set parameters to be $a = 1.3$, $b = 2$, $\mu_1 = 3$, $\mu_2 = 6$, $\sigma_1 = 0.9$, and $\sigma_2 = 1$. And set the function range from 0 to 10.
- Define a TRandom3 random number, and a histogram. Generate the events according to f1 using Monte-Carlo method (with "throw away events" method), and store them in the histogram. Then draw the histogram.

Exercise 3

- Same as Exercise 2, but now, you use the Monte-Carlo transformation method to generate a Gaussian distribution for e.g. $\mu = 5$, $\sigma = 3$.