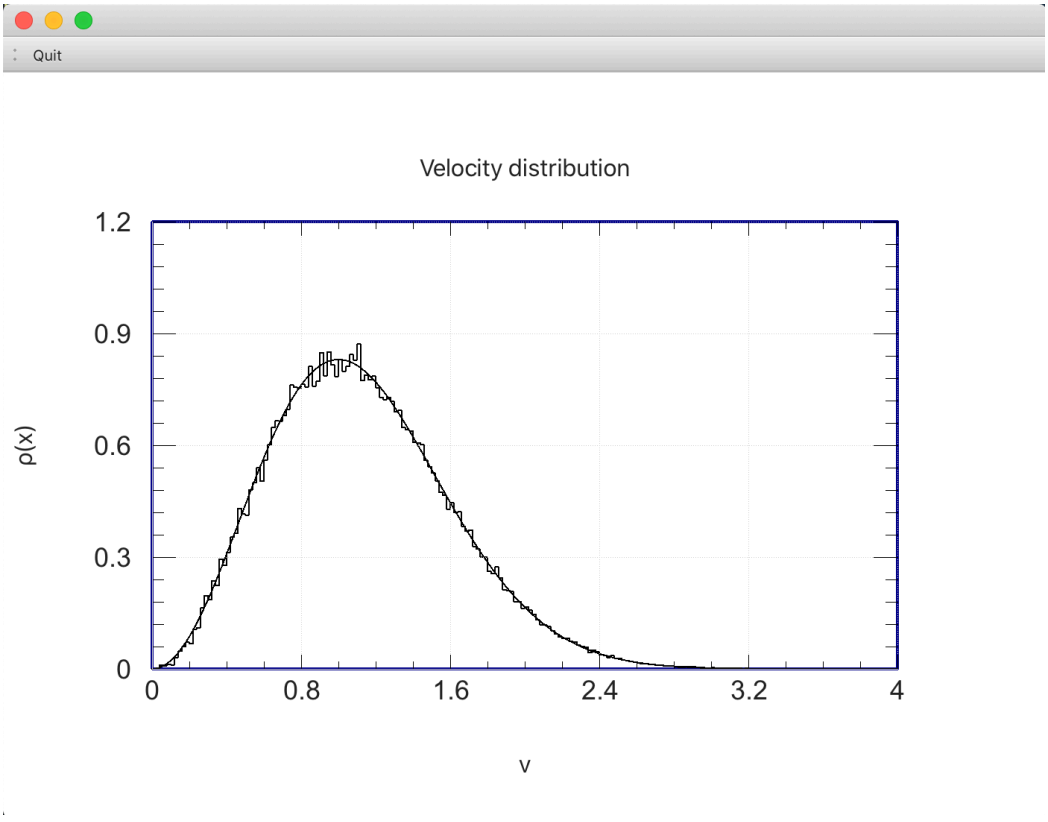
Assignment 7

EX1 EX2 EX3.
Complete the code of *class Stack* from SKELETONS.

EX6
Complete the code of class *StokesVector* and *MullerMatrix.*

EX7.2
For the gamma distribution, if we choose $\alpha = 2$, $\beta = 1$, we have $\rho(x)\mathrm{d}x = xe^{-x}\mathrm{d}x$. And we can set $2\tau/m = 1$, so that the velocity distribution becomes $\rho(v)\mathrm{d}v = 4/\sqrt{\pi}\, v^2 e^{-v^2}\mathrm{d}v$. So we have $\rho(v) = \rho(x)\mathrm{d}x/\mathrm{d}v = \rho(x)2v\mathrm{d}v$. Here we let $x = v^2$. Therefore we can sampling the velocity distribution with the help of gamma distribution. The sampling result are showed in follow:



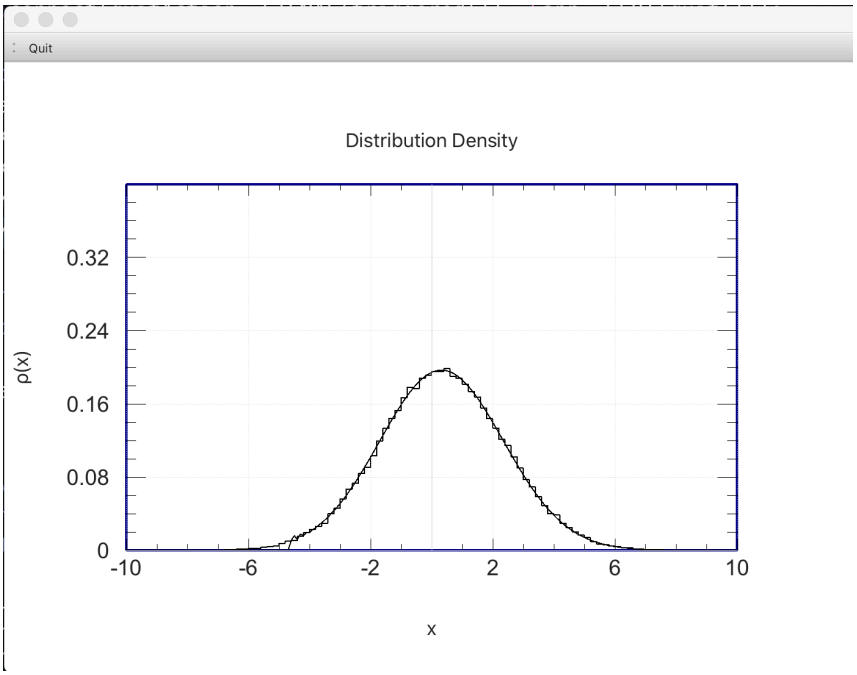
EX7.5
We have the normal distribution $\rho_n(x)\mathrm{d}x = 1/\sqrt{8\pi}e^{-x^2/8}\mathrm{d}x$ and the exponential distribution $\rho_e(x)\mathrm{d}x = 3e^{-3x}\mathrm{d}x$. Therefore we have the convolution:

$$\rho(u) = \int_{-\infty}^{\infty} \frac{3}{\sqrt{8\pi}} e^{-(u-v)^2/8} e^{-3v}\mathrm{d}v$$

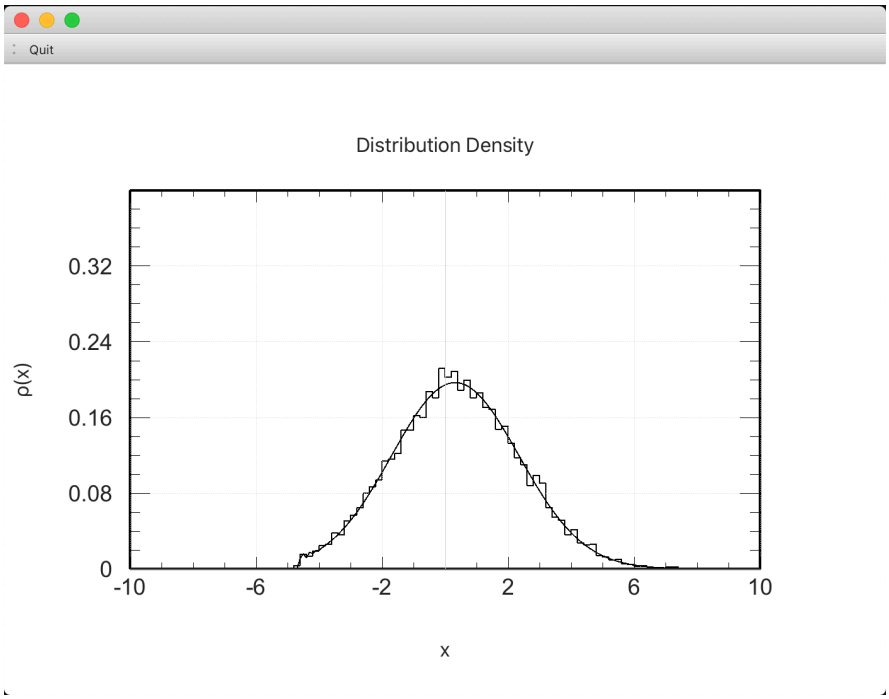
$$= \int_0^\infty \frac{3}{\sqrt{8\pi}} e^{-(u-v)^2/8} e^{-3v} dv = \int_0^\infty \frac{3}{\sqrt{8\pi}} e^{-u^2/8} e^{-v^2/8+uv/4-3v} dv$$

$$= \frac{3}{\sqrt{8\pi}} e^{-u^2/8} \left(e^{2(u/4-3)^2} (1 + \mathrm{Erf}(\sqrt{2}(u/4 - 3))) \right)$$

I plot the analytic convolution result and sum of two two variables below.

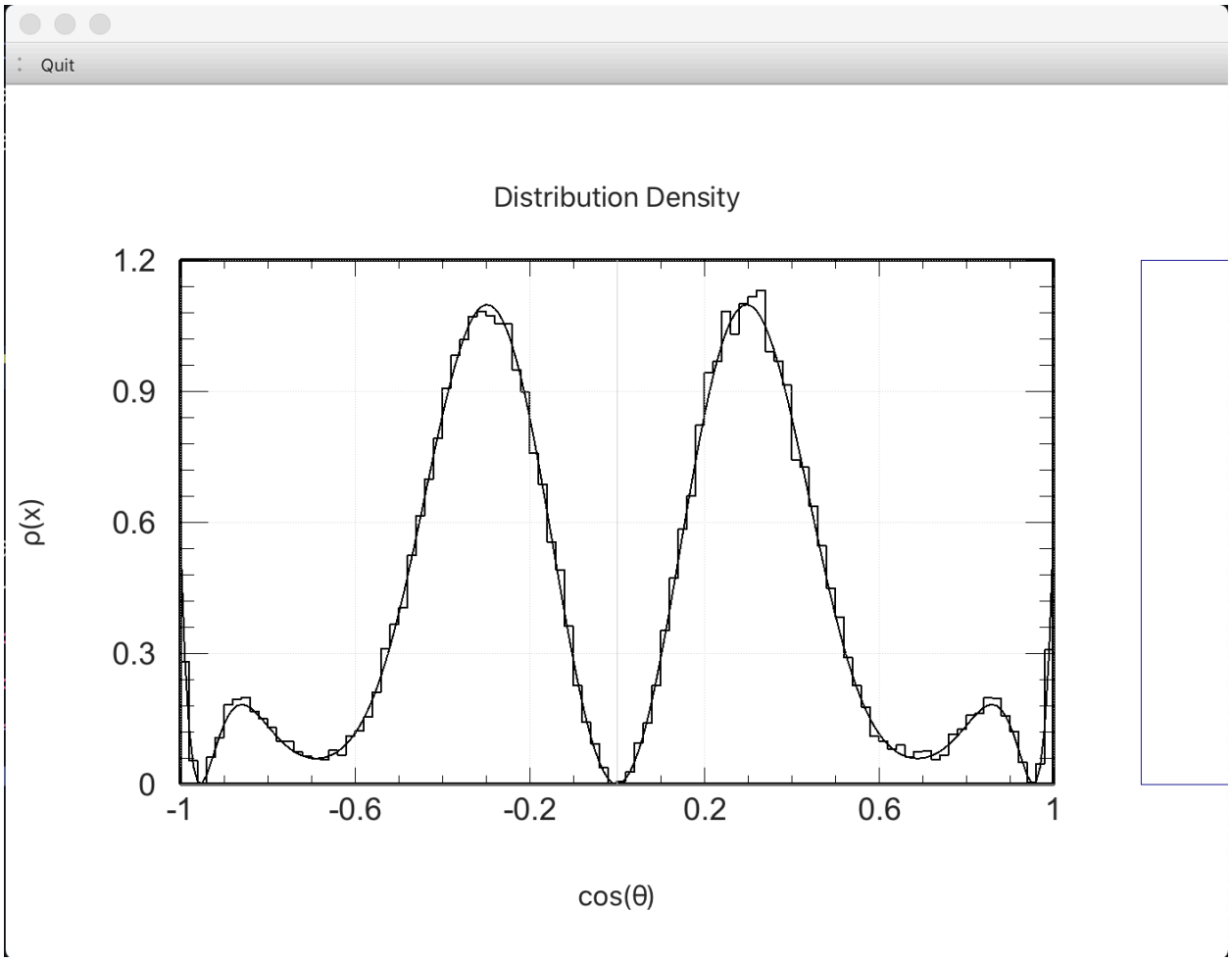


And we can also generate the distribution by using the rejection method. The result is showed below.



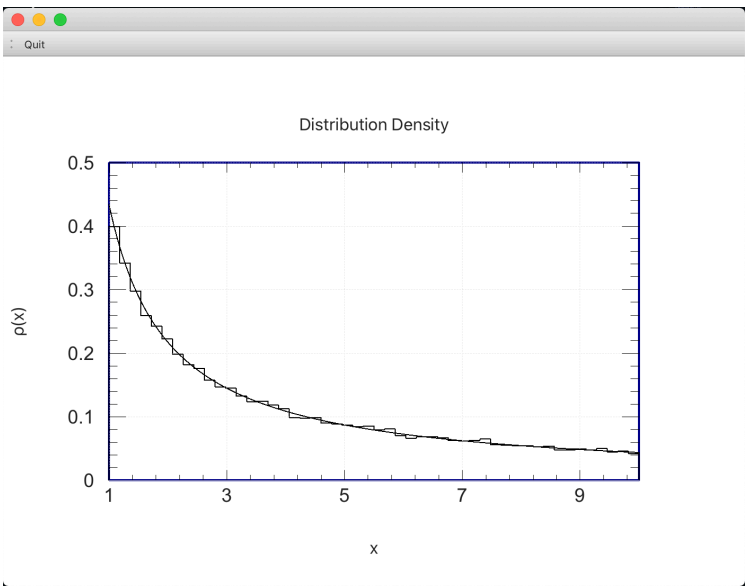
EX7.6

I generate the data by using the rejection method.



EX7.12

A) $f(x) = 10^x \Rightarrow x = \ln(f)/\ln 10 \Rightarrow \rho(x) = 1/(x\ln 10)$



B) In this question I set $M = \Gamma = 1$.

$$f(x) = \sqrt{1 + \tan(x)} \Rightarrow x = \arctan(f - 1) \Rightarrow \rho(x) = \frac{2x}{1 + (x^2 - 1)^2}$$