1. Generation of random numbers (inverse method)

Task 1. */1 point/* Generate $n = 100, 1000, 10000, \ldots$ random numbers from uniform distribution $U[0, 1]$. Plot histograms and compare to probability density function. Exemplary code in MATLAB:

```
subplot(2,1,1)
    n = 100;
    u = rand(n,1);
    hist(u)
    title(['Histogram for n = ', int2str(n)])
subplot(2,1,2)
    x = -0.1:0.002:1.1;
    pdf = unifpdf(x);
    plot(x, pdf, 'Color', 'red', 'LineWidth', 3)
    xlim([-0.05 1.05])
    ylim([-0.2 1.2])
    title('Probability Density Function')
```

Task 2. */4 points/* Apply inverse method to generate random numbers from the following distributions:

No	Distribution name	Probability density function
1	Logistic	$f(x\|\mu,\sigma) = \frac{\exp\left(\frac{x-\mu}{\sigma}\right)}{\sigma\left(1+\exp\left(\frac{x-\mu}{\sigma}\right)\right)^2},\ \sigma > 0$
2	Exponential	$f(x\|\mu) = \frac{1}{\mu}\exp\left(-\frac{x}{\mu}\right),\ x \geqslant 0,\ \mu > 0$
3	Triangular	$f(x\|c) = \frac{c-\|x\|}{c^2},\ \|x\| \leqslant c,\ c > 0$
4	Cauchy	$f(x\|\mu,\sigma) = \frac{1}{\pi\sigma\left[1+\left(\frac{x-\mu}{\sigma}\right)^2\right]},\ \sigma > 0$

Inverse method:

1. Generate $u \sim U[0, 1]$.
2. For the designed p.d.f. $f(x)$ compute $F()$ and its inverse $F^{-1}()$.
3. Compute $F^{-1}(u)$.

Plot histograms for generated data. Plot theoretical probability density functions - see `pdf` function in MATLAB.

/Total: 5 points/