2. Generation of random numbers
(rejection method)

Task 1. */5 points/* Apply rejection method to generate random numbers with p.d.f. $f()$ using supporting p.d.f. $g()$ and constant c:

No	Distribution names	p.d.f. $f(x)$	p.d.f. $g(x)$	c
1	f-normal N(0,1) g-Laplace	$f(x) = \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{x^2}{2}\right)$	$g(x) = \frac{1}{2}\exp\left(-|x|\right)$	$c = \sqrt{\frac{2e}{\pi}}$
2	f-Beta(2,1) g-uniform U[0,1]	$f(x) = \frac{\Gamma(2+1)}{\Gamma(2)\Gamma(1)}x^1(1-x)^0\mathbf{1}\left\{0 \leqslant x \leqslant 1\right\}$	$g(x) = \mathbf{1}\left\{0 \leqslant x \leqslant 1\right\}$	$c = 2$
3	f-Beta(3,2) g-uniform U[0,1]	$f(x) = \frac{\Gamma(3+2)}{\Gamma(3)\Gamma(2)}x^2(1-x)^1\mathbf{1}\left\{0 \leqslant x \leqslant 1\right\}$	$g(x) = \mathbf{1}\left\{0 \leqslant x \leqslant 1\right\}$	$c = \frac{16}{9}$
4	f-Beta(3/2,3/2) g-uniform U[0,1]	$f(x) = \frac{\Gamma(3)}{\Gamma(3/2)\Gamma(3/2)}x^{\frac{1}{2}}(1-x)^{\frac{1}{2}}\mathbf{1}\left\{0 \leqslant x \leqslant 1\right\}$	$g(x) = \mathbf{1}\left\{0 \leqslant x \leqslant 1\right\}$	$c = \frac{1}{\Gamma(3/2)^2} = \frac{4}{\pi}$
5	f-triangular g-uniform U[0,1]	$f(x) = 2(1-x)\mathbf{1}\left\{0 \leqslant x \leqslant 1\right\}$	$g(x) = \mathbf{1}\left\{0 \leqslant x \leqslant 1\right\}$	$c = 2$

Rejection method:

1. Generate $u \sim U[0, 1]$.

2. Generate x having the p.d.f. $g(x)$.

3. Create the pairs $(x, y) = (x, cg(x)u)$ for $c = \max \frac{f(x)}{g(x)}$.

4. Reject the pairs (x, y) that do not fulfill the condition $cg(x)u \leqslant f(x)$.

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

/Total: 5 points/