

# Assignment 1

## Computer simulation course

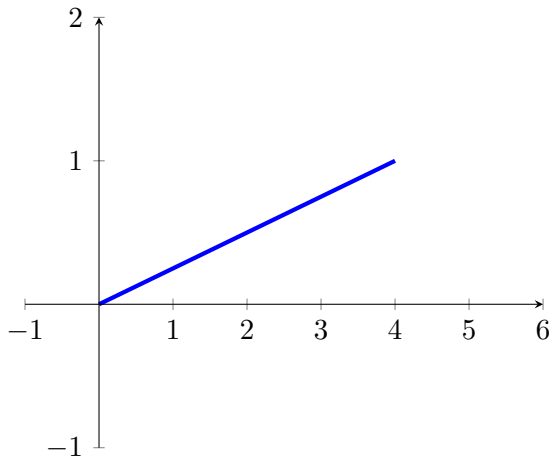
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### Exercise 1:

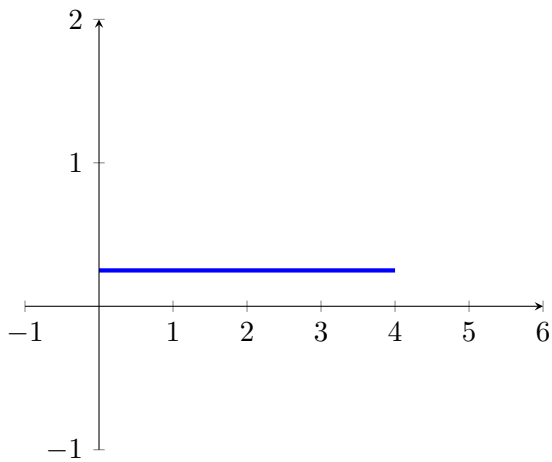
1. Last digit: 4.
2. Interval=(0,4).  $X \sim U(0,4)$ .

$$F_x(x) = \begin{cases} 0 & x \leq 0 \\ \frac{x}{4} & 0 \leq x \leq 4 \\ 1 & 4 \leq x \end{cases}$$



3. Probability density function:  $f(x) = F'_x = \frac{dx/4}{dx} = 1/4$ .

$$f(x) = \begin{cases} 0 & x \leq 0 \\ \frac{1}{4} & 0 \leq x \leq 4 \\ 0 & 4 \leq x \end{cases}$$



$$4. E(x) = \int_{-\infty}^{\infty} x f(x) dx = \int_0^4 \frac{x}{4} dx = 2.$$

$$Var(x) = E(X^2) - E^2(X) = \int_{-\infty}^{\infty} x^2 f(x) dx - 2^2 = 2$$

$$5. Y = X^2 \rightarrow F'_y = P(Y \leq x) = P(X^2 \leq x) = P(0 \leq x \leq \sqrt{x}) = \int_{-\infty}^{\infty} f(x) dx = \int_0^{\sqrt{x}} 1/4 dx = \frac{\sqrt{x}}{4} \rightarrow$$

$$F_y(y) = \begin{cases} 0 & y \leq 0 \\ \frac{\sqrt{y}}{4} & 0 \leq y \leq 16 \\ 0 & 16 \leq y \end{cases}$$

$$f(y) = F'_y(y) = \begin{cases} 0 & y \leq 0 \\ \frac{1}{8\sqrt{y}} & 0 \leq y \leq 16 \\ 0 & 16 \leq y \end{cases}$$

$$E(y) = \int_{-\infty}^{\infty} y f(y) dy = \int_0^{\sqrt{y}} \frac{y}{8\sqrt{y}} dy = (1/8) * (2/3) * (4^3) = 12.$$

$$Var(Y) = E(Y^2) - E^2(Y) = 102.7$$