

# Seminar 1

## Probabilities

### DEDP

1. Let  $A$  be a continuous r.v. with distribution  $\mathcal{U} [0, \pi]$ 
  - a. Draw the PDF of  $A$
  - b. Compute the probability that  $A > 1$
  - c. Compute the probability that  $A \in (0, 2)$
  - d. Draw the CDF function and write its mathematical expression
  - e. What is the distribution of  $B = A - 2$ ?
2. Let  $A$  be a r.v. with distribution  $\mathcal{N} (\mu = 1, \sigma^2 = 2)$ .
  - a. Compute the probability that  $A \in [2, 4]$
  - b. What is the distribution of  $B = A - 2$ ?
  - c. What is the maximum value of  $w_A(x)$  and for what  $x$  is it reached?
3. Let  $A$  be a **discrete** random variable with uniform distribution  $\mathcal{U} [0, 10]$ 
  - a. How many different realizations of  $A$  are possible?
  - b. Draw the PMF of  $A$
  - c. Find the probability that  $A$  is an odd number
  - d. Find the probability that  $A \in [3, 7]$
4. Compute the probability that three r.v.  $X, Y$  and  $Z$  i.i.d.  $\mathcal{N}(-1, 1)$  are all positive simultaneously
5. Consider 3 three normal random variables  $A \sim \mathcal{N} (\mu = 1, \sigma^2 = 3)$ ,  $B \sim \mathcal{N} (\mu = -4, \sigma^2 = 3)$ ,  $C \sim \mathcal{N} (\mu = 5, \sigma^2 = 3)$ .
  - a. Is it more likely that  $(A, B, C)$  has values around  $(2, -6, 3)$  or around  $(-2, -3, 2)$ ?
  - b. Find a set of values  $(x, y, z)$  such that  $(A, B, C)$  are as likely to be in a vicinity of  $(x, y, z)$  as in a vicinity of  $(2, -6, 3)$ .