(1+2+3+4+5=15 marks)

Question 1: Let $[\Omega, \mathcal{A}, P]$ be the probability space of rolling a fair die one time, an X is a random variable on $[\Omega, \mathcal{A}, P]$ defined as follow:

$$X: \Omega = \{ \underbrace{1}_{\omega_1}, \underbrace{2}_{\omega_3}, \underbrace{3}_{\omega_4}, \underbrace{5}_{\omega_5}, \underbrace{6}_{\omega_6} \} \longrightarrow \mathbb{R}$$
$$\omega \mapsto X(\omega) = \begin{cases} -1 & \text{for } \omega = \omega_1, \omega_2 \\ 0 & \text{for } \omega = \omega_3, \omega_4 \\ 1 & \text{for } \omega = \omega_5, \omega_6 \end{cases}$$

Then:

a) What type is this random variable X?

b)-What is the name of this random variable X?

c) Draw the graphical representation of this random variable X.

d) Determine the distribution function of X.

e) Calculate the mathematical expectation (the mean) of X.

Answers:

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(2+2+4+3+3+1=15 marks)

Question 2: Let X be a random variable with density function f_X given by the following relation:

$$f_X(x) = \begin{cases} \alpha x & \text{for } 0 \le x \le 1 \\ 0 & \text{Otherwise} \end{cases}$$

Where α is a constant. Then:

- a) Determine the value of α .
- b) Draw the graph of f_X .
- c) Calculate the following probabilities:

d-1) $P(-0.25 < X \le 0.25)$ **d-2**) P(X > 1.75) **d-3**) $P(X = 0.5) \le$

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