

EEE 431: Telecommunications I
Homework 1

- 1) Problem 5.9.
- 2) Problem 5.11.
- 3) Problem 5.22.
- 4) Problem 5.26.
- 5) Let U be a uniform random variable on the interval $(1, 5)$. Determine the probability density function of the following random variables.
 - a) $Y = \sqrt{\ln U}$.
 - b) $Z = \max(U, 3)$.
- 6) Assume that X is an exponential random variable with mean 2. Determine
 - a) $\mathbb{P}(X > 3)$.
 - b) $\mathbb{P}(X > 5 | X > 3)$.
 - c) $\mathbb{E}[X | X > 3]$.
 - d) $\mathbb{E}[X^2 | 3 < X < 5]$.
- 7) Let X and Y be two independent exponential random variables with means $1/2$ and $1/3$, respectively. Determine
 - a) the probability density function of $Z = \min(X, Y)$.
 - b) the probability density function of $W = \max(X, Y)$.
 - c) the joint probability density function of $Z = \min(X, Y)$ and $W = \max(X, Y)$.
- 8) A jointly Gaussian random vector $\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}$ has a mean vector $\begin{bmatrix} 1 \\ -2 \\ 1 \end{bmatrix}$, and a covariance matrix
$$\mathbf{C} = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 3 & -1 \\ 1 & -1 & 2 \end{bmatrix}.$$
 - a) Determine the mean and covariance matrix of the random vector $\begin{bmatrix} X \\ Z \end{bmatrix}$.
 - b) Two random variables W and V are defined as $W = 2X + Z$ and $V = -Y + 2Z$. Determine their joint distribution.