

Directions: Work all problems on separate paper. Be neat and show your work.

1. (30 points) Let X have continuous pdf given by

$$f_X(x) = \begin{cases} c(x+2), & -2 < x < 2 \\ 0, & \text{elsewhere} \end{cases}$$

- (a) Find c .
(b) Find $P(0 < x < 1.5)$
(c) Find $P(0 \leq x \leq 1.5)$
(d) Find $E(X)$.
(e) Find the CDF, $F_X(x)$; make sure you have it defined for all reals.
2. (30 points) Let X and Y be jointly distributed random variables with

$$f_{X,Y}(x,y) = \begin{cases} 1/2, & 0 \leq x \leq y \leq 2 \\ 0, & \text{elsewhere} \end{cases}$$

- (a) Are X and Y independent? Explain, but do NOT calculate any marginal pdfs.
(b) Set up an integral which gives $P(2Y + X < 2)$. Do NOT evaluate the integral.
(c) Find $f_X(x)$, the marginal pdf for X . Make the support clear.
3. (18 points) Ten independent observations are drawn from the continuous pdf

$$f_T(t) = \begin{cases} 2t, & 0 \leq t \leq 1 \\ 0, & \text{elsewhere} \end{cases}$$

Let X denote the number of T 's that fall between 0 and $1/2$.

- (a) Find $P(X \leq 2)$.
(b) Find the expected value of X .
4. (12 points) Let X have pdf

$$f_X(x) = \begin{cases} x/8, & 0 \leq x \leq 4 \\ 0, & \text{elsewhere} \end{cases}$$

Find the pdf for $Y = \sqrt{X}$. Show your work clearly. Make your support clear.