= 4 Math 323 Final Examination May 5,1994

Let X be a uniform random variable on the interval [-3,3]. For $U = X^2 + 1$ and for $1 \leq u \leq 10$, we have the density function $f_U(u)$, given by

$\frac{1}{6\sqrt{u-1}}$ $\frac{1}{12\sqrt{u-1}}$ $\frac{1}{6\sqrt{u^2+1}}$ $\frac{1}{12\sqrt{u^2+1}}$ $\frac{1}{18\sqrt{u-1}}$ 1:bcaed 2:acebd 3:dbcea 4:cadbe

Let X_1 and X_2 have joint density function

$$f(x_1, x_2) = \begin{cases} 1 & \text{if } 0 \leq x_1 \leq 1 \text{ and } 0 \leq x_2 \leq 1 \\ \\ 0 & \text{elsewhere.} \end{cases}$$

For the function $U = X_1 X_2$ find the density function $f_U(u)$ where $0 \leq u \leq 1$.

$-ln\ u$ $-u(ln\ u)$ $-2u\ (ln\ u)$ $u - u(ln\ u)$ $u - ln\ u$ 1:cbdae 2:bdaec 3:daecb 4:aecbd

A restaurant has found that 40% of its customers order chicken, 20% order beef and 40% order fish. A table of 8 customers is about to order. What is the probability that 2 order chicken, 3 order beef and 3 order fish? .046 .027 .083 .066 .091 1:abcde 2:cebad 3:cbaed 4:cadbe

Let X_1 and X_2 be discrete random variables whose joint probability function vanishes except for the six values:

p(0,0) = $\frac{1}{6}$	p(1,0) = $\frac{1}{3}$	p(2,0) = $\frac{1}{6}$
p(0,1) = $\frac{1}{12}$	p(1,1) = $\frac{1}{6}$	p(2,1) = $\frac{1}{12}$

Find the covariance cov(X_1, X_2).

0 1 $\frac{1}{2}$ $\frac{1}{3}$ $\frac{-1}{2}$

1:acbed 2:cbeda 3:bedac 4:adbec

A pair of dice is rolled 18,000 times. Find the probabilty that a sum of 7 occurs at least 3,000 times. Use a normal approximation to the binomial. .504 .500 .508 .496 .492 1:baced 2:acedb 3:cedba 4:edbac

Let X_1 and X_2 be independent random variables whose standard deviations are σ_1 and σ_2, respectively. What is the standard deviation of $3X_1 + 4X_2$? $\sqrt{9{\sigma_1}^2 + 16{\sigma_2}^2}$ $9\sigma_1 + 16\sigma_2$ $3\sigma_1 + 4\sigma_2$ $\sqrt{9\sigma_1 + 16\sigma_2}$ $\sqrt{3{\sigma_1}^2 + 4{\sigma_2}^2}$ 1:cbade 2:badec 3:adecb 4:decba

Let X_1 and X_2 have joint density function

$$f(x_1, x_2) = \begin{cases} kx_1 & \text{if } 0 \leq 2x_2 \leq x_1 \leq 2 \\ \\ 0 & \text{elsewhere.} \end{cases}$$

For $f(x_1, x_2)$ to be a legitimate density function what must k equal? $\frac{3}{4}$ $\frac{3}{8}$ $\frac{2}{3}$ $\frac{1}{4}$ $\frac{1}{6}$

1:bdaec 2:daecb 3:aecbd 4:eacbd

For the random variables of problem 7 we have $f_X(x_1) = \frac{3}{8}{x_1}^2$ and $E(X_2|X_1 = x_1) = \frac{x_1}{4}$. Use this information to compute $E(X_2)$.

$\frac{3}{8}$ $\frac{2}{3}$ $\frac{3}{128}$ $\frac{1}{3}$ $\frac{3}{64}$

1:edcba 2:daecb 3:aecbd 4:ecbda

Let X have density function

$$f(x) = \begin{cases} xe^{-\frac{x^2}{2}} & \text{if } x > 0 \\ \\ 0 & \text{elsewhere.} \end{cases}$$

Let $U = X^2$. Find $f_U(2)$.

$\frac{1}{2}e^{-1}$ $2e^{-2}$ $2e^{-1}$ $\frac{1}{2}e^{-2}$t $\frac{1}{4}e^{-2}$

1:bacde 2:acdeb 3:cdeba 4:debac

Let X and Y have means 3 and 4 respectively. Say E(XY) = 18.

Find the covariance cov(X,Y).

6 20 12 4 16

1:baecd 2:ecdab 3:ecdba 4:cdbae

A pair of dice is rolled. Given that at least one of the dice shows a 1, what is the probability that the sum of the dice is at most 5?

$\frac{7}{11}$ $\frac{10}{11}$ $\frac{7}{12}$ $\frac{5}{18}$ $\frac{5}{12}$

1:baecd 2:decab 3:ecdba 4:cdbae

Let A and B be events with P(A) = 0.2, P(B) = 0.5 and $P(A \cap B) = 0.1$. Find the probability that neither A nor B occurs..

0.4 0.3 0.2 0.5 0.6 1:ecbda 2:bdaec 3:dabce 4:dabce

In problem 12 are A and B independent? Yes No Don't choose this answer Don't choose this answer Don't choose this answer 1:baecd 2:cdbae 3:dbaec 4:ecdba

Let X have density function

$$f(x) = \begin{cases} (2+x)/4 & \text{if } -2 \le x \le 0 \\ \\ (2 - x)/4 & \text{if } 0 \le x \le 2. \end{cases}$$

Find $F_X(1)$. $\frac{7}{8}$ $\frac{3}{4}$ $\frac{5}{8}$ $\frac{11}{16}$ $\frac{13}{16}$ 1:ecbad 2:decba 3:ecbad 4:cbade

Four components each have an exponential distribution with an average life of three years. If all are turned on, find the probability that exactly three will be working one year later.

.417 .301 .266 .182 .094 1:cbeda 2:edacb 3:dacbe 4:cbeda

Let X_1 and X_2 have joint density function

$$f(x_1, x_2) = \begin{cases} x_1 + x_2 & \text{if } 0 \le x_1 \le 1 \text{ and } 0 \le x_2 \le 1 \\ \\ 0 & \text{elsewhere.} \end{cases}$$

Find $E(X_1|X_2 = x_2)$.

$\frac{3x_2+2}{6x_2+3}$ $\frac{3x_2+2}{2x_2+1}$ $\frac{2x_2+1}{4x_2+3}$ $\frac{3x_2+1}{6x_2+1}$ $\frac{2x_2+3}{x_2+6}$ 1:cabde 2:abdec 3:decab 4:ecabd

Suppose that 20% of the membership in a club would answer "Yes" to the question: "Do you like classical music?" What is the probability that 6 people (randomly selected) would have to be questioned before getting 4 "Yes" responses?

.010 .002 .027 .032 .080 1:abcde 2:bcdea 3:cdeab 4:deabc

The number of dandelions growing in a lawn has a Poisson distribution with a mean of 2 dandelions per square yard. Find the probability that a section of 3 square yards will contain at least 2 dandelions.

$1 - 7e^{-6}$ $1 - e^{-6}$ $1 - e^{-2}$ $1 - 6e^{-6}$ $1 - 3e^{-2}$ 1:abcde 2:bcdea 3:cdeab 4:deabc

A discrete random variable X has probability function: p(0) = .1, p(1) = .5, p(2) = .4 and p(x) = 0 elsewhere.

Find V(X).

.410 .315 .452 .368 .287 1:abcde 2:bcdea 3:cdeab 4:deabc

Let X be a random variable with mean $\mu = 3$ and standard deviation $\sigma = 2$. Use Tchebysheff's inequality to complete the next sentence. The probability that X is not less than 6 units from the mean is at most

$\frac{1}{9}$ $\frac{1}{4}$ $\frac{1}{36}$ $\frac{1}{25}$ $\frac{1}{16}$ 1:cbeda 2:edacb 3:dacbe 4:acbed

Find the value of

$$\sum_{y=3}^{\infty} \binom{y-1}{2} (.1)^4 (.9)^{y-3}.$$

0.1 1 10 $\frac{1}{9}$ 0.9 1:bedac 2:cedab 3:edacb 4:cabed

Among 6 motors produced by an assembly line 2 are defective. Three of the six are selected for sale. Find the probability that none of these is defective.

$\frac{1}{5}$ $\frac{1}{6}$ $\frac{1}{4}$ $\frac{1}{7}$ $\frac{1}{8}$ 1:cbeda 2:edacb 3:edacb 4:cbeda

A committee consists of 3 women and 5 men. Two of the members are to be chosen to form a subcommittee. Let X denote the number of women in the subcommittee. Find the expected value E(X).

$\frac{21}{28}$ $\frac{41}{28}$ $\frac{18}{28}$ $\frac{31}{28}$ $\frac{25}{28}$ 1:cbeda 2:edacb 3:dacbe 4:acbed

Let X be normal with $\mu = 2$ and $\sigma = 3$. Find $P(-1 \le X \le 3.5)$.

.5328 .1915 .3830 .3413 .6826 1:edacb 2:dcbae 3:acbed 4:cbeda

Telephone calls arrive at a switchboard at the rate of 4 per hour. Let X denote the time in hours elapsed before the 5th call comes in. Which of the following is the distribution of X?

Gamma with $\alpha = 5$ and $\beta = \frac{1}{4}$ Poisson with $\lambda = \frac{4}{5}$ Gamma with $\alpha = 5$ and $\beta = 4$ Beta with $\alpha = 5$ and $\beta = 4$ Beta with $\alpha = 5$ and $\beta = \frac{1}{4}$ 1:ebcad 2:bcade 3:bcade 4:adebc