

Test 2
Formula Sheet

$$Var(X) = E(X^2) - (E(X))^2, Cov(X, Y) = E[XY] - E[X]E[Y]$$

1. Let X have pdf

$$f_X(x) = \begin{cases} 1/x^2, & x > 1 \\ 0, & \text{otherwise} \end{cases}$$

(a) Find the median of the distribution. This is the value m such that $\int_{-\infty}^m f(x) dx = 1/2$.

(b) Find $P(X > 5 | X > 4)$.

(c) Let $Y = 1/X$. Find $f_Y(y)$. Be sure to define $f_Y(y)$ for $-\infty < y < \infty$.

(d) Find $Cov(X, Y)$.

2. Let X and Y be independent where X is exponential with rate 1 and Y is exponential with rate 2:

$$f_X(x) = e^{-x} I(x > 0), \quad f_Y(y) = 2e^{-2y} I(y > 0)$$

Find the density for $Z = X + Y$.

3. Let X and Y have joint mass function

X	Y		
	1	2	3
1	1/9	1/18	1/18
2	1/18	1/9	2/9
3	1/18	2/9	1/9

- (a) Are X and Y independent? Justify your answer.
- (b) What is $E[X]$?