

Homework #5

Due on 09/28/2026, Monday, before class.

1. Exercise 1.7.6 (b) on page 58

1.7.6. For each of the following pdfs of X , find $P(|X| < 1)$ and $P(X^2 < 9)$.

(b) $f(x) = (x + 2)/18$, $-2 < x < 4$, zero elsewhere.

2. Exercise 1.7.9 (a) (b) on page 58

1.7.9. The median and quantiles, in general, are discussed in Section 1.7.1. Find the median of each of the following distributions:

(a) $p(x) = \frac{4!}{x!(4-x)!} \left(\frac{1}{4}\right)^x \left(\frac{3}{4}\right)^{4-x}$, $x = 0, 1, 2, 3, 4$, zero elsewhere.

(b) $f(x) = 3x^2$, $0 < x < 1$, zero elsewhere.

3. Exercise 1.7.24 on page 60

1.7.24. Let X have the uniform pdf $f_X(x) = \frac{1}{\pi}$, for $-\frac{\pi}{2} < x < \frac{\pi}{2}$. Find the pdf of $Y = \tan X$. This is the pdf of a **Cauchy distribution**.

4. Exercise 1.8.3 on page 66

1.8.3. Let X have the pdf $f(x) = (x + 2)/18$, $-2 < x < 4$, zero elsewhere. Find $E(X)$, $E[(X + 2)^3]$, and $E[6X - 2(X + 2)^3]$.

5. Exercise 1.8.4 on page 66

1.8.4. Suppose that $p(x) = \frac{1}{5}$, $x = 1, 2, 3, 4, 5$, zero elsewhere, is the pmf of the discrete-type random variable X . Compute $E(X)$ and $E(X^2)$. Use these two results to find $E[(X + 2)^2]$ by writing $(X + 2)^2 = X^2 + 4X + 4$.

6. Exercise 1.8.9 on page 67

1.8.9. Let $f(x) = 2x$, $0 < x < 1$, zero elsewhere, be the pdf of X .

(a) Compute $E(1/X)$.

(b) Find the cdf and the pdf of $Y = 1/X$.

(c) Compute $E(Y)$ and compare this result with the answer obtained in part (a).