

April 26, 2006 — Final Exam Review Sheet

Review Problems

1. Compute the integrals

(a)

$$\int_1^{\infty} \frac{1}{x^3} dx =$$

(b)

$$\int_1^{\infty} e^{-3x} dx =$$

(c)

$$\int_{-4}^{\infty} e^{-2x} dx =$$

(d)

$$\int_{-\infty}^6 e^{x/7} dx =$$

(e)

$$\int_{-\infty}^6 e^{-x/7} dx =$$

2. Identify the functions below that are probability density functions

(a)

$$f(x) = x^2$$

(b)

$$f(x) = \begin{cases} \frac{3}{2}x^2 & \text{if } -1 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

(c)

$$f(x) = \begin{cases} 2x - 2 & \text{if } 1 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

(d)

$$f(x) = \begin{cases} \frac{2}{3}x - \frac{4}{3} & \text{if } 1 \leq x \leq 4 \\ 0 & \text{otherwise} \end{cases}$$

3. Find the value of a that make the functions below pdf's.

(a)

$$f(x) = \begin{cases} ax & \text{if } 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

(b)

$$f(x) = \begin{cases} ax & \text{if } 1 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

(c)

$$f(x) = \begin{cases} ax & \text{if } -2 \leq x \leq 0 \\ 0 & \text{otherwise} \end{cases}$$

(d)

$$f(x) = \begin{cases} ax & \text{if } -1 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

(e)

$$f(x) = \begin{cases} \ln x & \text{if } 1 \leq x \leq a \\ 0 & \text{otherwise} \end{cases}$$

4. For each of the pdf's below, find the cdf, the mean, the variance, the median, the standard deviation.

(a)

$$f(x) = \begin{cases} 2x & \text{if } 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

(b)

$$f(x) = \begin{cases} \frac{3}{7}x^2 & \text{if } 1 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

(c)

$$f(x) = \begin{cases} \frac{3}{7}x^2 & \text{if } 1 \leq x \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

(d)

$$f(x) = \begin{cases} \frac{3}{x^4} & \text{if } x \geq 1 \\ 0 & \text{otherwise} \end{cases}$$

5. An exponential random variable has mean 6, find:

(a) $\lambda =$

(b) The median

(c) The standard deviation

(d) The probability that X is less than -2 .

(e) $P(X > -2) =$

(f) $P(X > 2) =$

(g) $P(1 \leq X < 5) =$

(h) $P(-1 \leq X \leq 5) =$

6. The waiting time in a bank line is represented with an exponential random variable. Suppose 10% of the customers wait 15 minutes or more. Find:
- (a) $\lambda =$
 - (b) The average wait.
 - (c) The median
 - (d) The standard deviation
 - (e) The percentage of customers who wait more than 20 minutes.
 - (f) The percentage of customers who wait more than 10 minutes.
 - (g) The percentage of customers who wait less than 1 minute.
 - (h) The most number of minutes that the 10% quickest served customers wait.
 - (i) The least number of minutes that the 5% slowest served customers wait.
7. The waiting time in a bank line is represented with a normal random variable. The average wait is 10 minutes and the standard deviation is 3 minutes. Find:
- (a) The median wait
 - (b) The variance
 - (c) The percentage of customers who wait more than 15 minutes.
 - (d) The percentage of customers who wait more than 10 minutes.
 - (e) The percentage of customers who wait less than 1 minute.
 - (f) The percentage of customers who wait between 1 and 6 minutes.
 - (g) The proportion of customers who wait between 6 and 18 minutes.
 - (h) The most number of minutes that the 10% quickest served customers wait.
 - (i) The least number of minutes that the 5% slowest served customers wait.

Area Under the Standard Normal Curve ($\mu = 0, \sigma = 1$) From 0 to z

[illegible]