

Math 425 Final Exam Review Problems

The final exam is *cumulative*. The problem selection below is *not* exhaustive.

1. Seventy percent of the light aircraft that disappear while in flight in a certain country are subsequently discovered. Of the aircraft that are discovered, 60% have an emergency locator, whereas 90% of the aircraft not discovered do not have such a locator. Suppose that a light aircraft has disappeared.

- (a) If it has an emergency locator, find the probability that it will not be discovered.
- (b) If it doesn't have a locator, find the probability that it will be discovered.

2. Suppose that the random variable X has probability density function

$$f(x) = \begin{cases} \frac{x}{25} & \text{if } x \in (0, 5) \\ c - \frac{x}{25} & \text{if } x \in (5, 10) \\ 0 & \text{otherwise.} \end{cases}$$

- (a) Determine c . Find $P(X \in (3, 6))$.
- (b) Find the variance of X .

3. The time T (in hours) required to repair a machine is an exponential random variable with parameter $\lambda = 3$. The repair company charges the amount X for the repair (in dollars) determined by the formula $X = 10 + e^{\frac{T}{3}}$.

- (a) What is the expected cost of the repair?
- (b) Find the probability density function of X .

4. Suppose the joint pdf of X and Y is

$$f(x, y) = \begin{cases} cx^{-2} & \text{if } 0 < y < x^2 \text{ and } |x| < 1 \\ 0 & \text{otherwise.} \end{cases}$$

- (a) Determine c . Find $P(X \in (-0.5, 0.5), Y \in (0, 0.5))$.
- (b) Determine the marginal densities of X and Y .
- (c) Find $P(Y > 0.1 | X = 0.4)$ and $P(Y > \frac{1}{4} | X > \frac{3}{4})$.

5. A man aiming at a target receives 10 points if his shot is within 1 inch of the target, 5 points if it is between 1 and 3 inches from the target, 3 points if it is between 3 and 5 inches from the target, and no points if it is further away. Find the expected number of points scored if the man's shot is uniformly distributed in a circle of radius 8 inches centered at the target.