
Name

1. Let $X \sim \text{Exp}(\lambda)$.

(a) (10 points) Find the pdf of $Y = 2X$.

(b) (10 points) Find the pdf of $Y = X^2$.

(c) (10 points) Find the pdf of $Y = X^3$.

2. Let X have the pmf

$$p_X(x) = \begin{cases} \frac{1}{8} & x \in \{\pm 1, \pm \frac{1}{2}\} \\ \frac{1}{2} & x = 0 \\ 0 & \text{otherwise} \end{cases} .$$

Find the pmf for the following functions:

(a) (10 points) X^2 .

(b) (10 points) e^X .

3. Let $X_1, X_2 \stackrel{iid}{\sim} \text{Exp}(\frac{1}{2})$.

(a) (10 points) Find the pdf of $Y = X_1 + X_2$.

(b) (10 points) Find the pdf of $Y = X_1 - X_2$.

(c) (10 points) Find the pdf of $Y = \max(X_1, X_2)$.

(d) (10 points) Find the pdf of $Y = \min(X_1, X_2)$.

4. (10 points) Let X be normally distributed with parameters $\mu = 0$ and $\sigma^2 = 1$. What is the pdf of X^2 ?

5. **Extra Credit:** No proofs are needed for the following questions. If you don't know the answer, feel free to make an educated guess. You can give the pdf/pmf, or just give the name and parameters of the distribution.

(a) (2 points) If $X_1, \dots, X_n \stackrel{iid}{\sim} \text{Exp}(\lambda)$, what is the distribution of $Y = \sum_{i=1}^n X_i$?

(b) (2 points) If $X \sim N(\mu, \sigma^2)$, what is the distribution of $Y = \left(\frac{X-\mu}{\sigma}\right)^2$?

(c) (2 points) If $X_1, \dots, X_n \stackrel{iid}{\sim} N(\mu, \sigma^2)$, what is the distribution of $Y = \sum_{i=1}^n \left(\frac{X_i - \mu}{\sigma}\right)^2$?

(d) (2 points) What are two possible sets of the name and parameter value of the marginal distribution of Y in question 1(a)?

(e) (2 points) What are two possible sets of the name and parameter value of the distribution of Y in question 3(a)?