QUIZ 01

PSTAT 120B: Mathematical Statistics, I
Summer Session A, 2024 with Instructor: Ethan P. Marzban

Your Information

Your Name:____
(*First and Last*)

Your NetID:____
(*NOT Perm Number*)

Your Section: **2pm (Hyuk-Jean)** **3pm (Hyuk-Jean)** **4pm (Minwoo)** **5pm (Minwoo)**
(*Circle One*)

Instructions

- **PLEASE DO NOT REMOVE ANY PAGES FROM THIS QUIZ.**
- You have **20 minutes** to complete this quiz.
- The use of **calculators** is permitted, but the use of any other aids (including, but not limited to, notes, phones, laptops, etc.) is prohibited.
- Ensure you show **all your work**; correct answers with no supporting justification will not receive full credit.
- Kindly note that any instances of academic misconduct (including, but not limited to: unauthorized collaboration, or the use of unauthorized resources) will be dealt with in the strictest manner possible.
- Please refrain from discussing the contents of this quiz with **ANYONE**, until given the all-clear by the Instructor.
- **Good Luck!**

This quiz contains ??? points in total

The Quiz Begins on the Next Page

Selected Discrete Distributions

Distribution	**PMF**	**Expec./Var.**	**MGF**
$X \sim \text{Bin}(n, p)$	$p_X(k) = \binom{n}{k} p^k (1-p)^{n-k}$, $k \in \{0, \cdots, n\}$	$\mathbb{E}[X] = np$ $\text{Var}(X) = np(1-p)$	$M_X(t) = (1 - p + pe^t)^n$
$X \sim \text{Geom}(p)$	$p_X(k) = p(1-p)^{k-1}$, $k \in \{1, 2, \cdots\}$	$\mathbb{E}[X] = \frac{1}{p}$ $\text{Var}(X) = \frac{1-p}{p^2}$	$M_X(t) = \frac{pe^t}{1-(1-p)e^t}$, $t < -\ln(1-p)$
$X \sim \text{Geom}(p)$	$p_X(k) = p(1-p)^k$, $k \in \{0, 1, \cdots\}$	$\mathbb{E}[X] = \frac{1-p}{p}$ $\text{Var}(X) = \frac{1-p}{p^2}$	$M_X(t) = \frac{p}{1-(1-p)e^t}$, $t < -\ln(1-p)$
$X \sim \text{NegBin}(r, p)$	$p_X(k) = \binom{k-1}{r-1} p^r (1-p)^{k-r}$, $k \in \{r, r+1, \cdots\}$	$\mathbb{E}[X] = \frac{r}{p}$ $\text{Var}(X) = \frac{r(1-p)}{p^2}$	$M_X(t) = \left[\frac{pe^t}{1-(1-p)e^t}\right]^r$, $t < -\ln(1-p)$
$X \sim \text{Pois}(\lambda)$	$p_X(k) = e^{-\lambda} \cdot \frac{\lambda^k}{k!}$, $k \in \{0, 1, \cdots\}$	$\mathbb{E}[X] = \lambda$ $\text{Var}(X) = \lambda$	$M_X(t) = \exp\left\{\lambda(e^t - 1)\right\}$

Selected Continuous Distributions

Distribution	**PDF**	**Expec./Var.**	**MGF**
$X \sim \text{Unif}[a, b]$	$f_X(x) = \dfrac{1}{b-a} \cdot \mathbb{1}_{\{x \in [a,b]\}}$	$\mathbb{E}[X] = \frac{a+b}{2}$ $\text{Var}(X) = \frac{(b-a)^2}{12}$	$M_X(t) = \begin{cases} \frac{e^{tb}-e^{ta}}{t(b-a)} & \text{if } t \neq 0 \\ 1 & \text{if } t = 0 \end{cases}$
$X \sim \text{Exp}(\beta)$	$f_X(x) = \dfrac{1}{\beta} e^{-x/\beta} \cdot \mathbb{1}_{\{x \geq 0\}}$	$\mathbb{E}[X] = \beta$ $\text{Var}(X) = \beta^2$	$M_X(t) = (1 - \beta t)^{-1},\ t < 1/\beta$
$X \sim \text{Gamma}(\alpha, \beta)$	$f_X(x) = \dfrac{1}{\Gamma(\alpha)\beta^\alpha} x^{\alpha-1} e^{-x/\beta} \cdot \mathbb{1}_{\{x \geq 0\}}$	$\mathbb{E}[X] = \alpha\beta$ $\text{Var}(X) = \alpha\beta^2$	$M_X(t) = (1 - \beta t)^{-\alpha},\ t < 1/\beta$
$X \sim \mathcal{N}(\mu, \sigma^2)$	$f_X(x) = \dfrac{1}{\sqrt{2\pi\sigma^2}} \exp\left\{-\dfrac{(x-\mu)^2}{2\sigma^2}\right\}$	$\mathbb{E}[X] = \mu$ $\text{Var}(X) = \sigma^2$	$M_X(t) = \exp\left\{\mu t + \frac{\sigma^2}{2} t\right\}$