Math3810 - Probability
Section 001 - Fall 2025
Introductory Homework #8

University of Colorado Denver / College of Liberal Arts and Sciences

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Name: **Student Number:**

Instructions

Show all reasoning clearly. All simulation results should be reproducible and clearly labeled. You may use R for all computations.

Problems

1. **Transformations of Random Variables**

   (a) Let $X \sim N(10, 4)$. Define $Y = 3X - 5$. Compute the mean and variance of Y.

   (b) Let $X \sim N(5, 9)$. Define $Y = -2X + 7$. Compute the mean and variance of Y.

   (c) Standardize $X \sim N(\mu, \sigma^2)$ to $Z = (X - \mu)/\sigma$. Compute $P(X < 15)$ for $X \sim N(12, 16)$ using standardization.

2. **Simulation of Linear Transformations**

   (a) Simulate 50, 100, 1000, and 50000 draws from $X \sim N(5, 2^2)$ and $Y = -3X + 2$. Plot histograms overlaying X and Y.

   (b) Plot the empirical CDFs of X and Y and compare with theoretical CDFs.