Name:

MATH 321: In-Class 17

1. Find $V(W - 3X - 0.5Y + 4Z)$ in terms of the variances and covariances of W, X, Y and Z.

2. Let X_1, X_2, X_3 be mutually independent random variables where $X_1 \sim \text{Bin}\,(n = 3, p = 0.2)$, $X_2 \sim \text{Bin}\,(n = 4, p = 0.2)$, and $X_3 \sim \text{Bin}\,(n = 5, p = 0.2)$.

   (a) Find $P(X_1 = 2, X_2 = 1, X_3 = 3)$.

   (b) Find the distribution of $S = X_1 + X_2 + X_3$ using the mgf technique.

   (c) Find $P(S < 4)$.

3. Suppose $f(x, y, z) = \frac{1}{4}x, \quad 0 \leq x \leq 2, 0 \leq y \leq 1, 0 \leq z \leq 2.$

   (a) Find the marginal distribution $f(y)$.

   (b) Find the conditional distribution $f(x, z \mid y)$.

4. Let X_1, X_2, X_3 be mutually independent random variables where $X_1 \sim \text{Normal}\,(\mu = 150, \sigma^2 = 225)$, $X_2 \sim \text{Normal}\,(\mu = 100, \sigma^2 = 64)$, and $X_3 \sim \text{Normal}\,(\mu = 200, \sigma^2 = 81)$.

   Find $P(X_1 + 3X_2 < 2X_3)$.

   HINT: Rearrange the probability statement to see the distribution we need to find first.