

5080-Quiz

Name:

1. Let X_1, X_2, X_3 be independent identically distributed normal $N(0, 5)$ random variables. Compute

$$P\{X_1^2 + X_2^2 + X_3^2 \leq 15\}$$

using one of the enclosed tables.

$$\begin{aligned} & P\left(X_1^2 + X_2^2 + X_3^2 \leq 15\right) \\ &= P\left(\frac{X_1^2}{5} + \frac{X_2^2}{5} + \frac{X_3^2}{5} \leq 3\right) \\ &= P\left(\chi^2(3) \leq 3\right) \end{aligned}$$

where $\chi^2(3)$ has a χ^2 distribution with 3 degrees of Freedom.

There is a problem on the back.

2. Let X_1 and X_2 be two independent random variables. X_1 is normal $N(1, 4)$ and X_2 is normal $N(1, 2)$. Compute

$$P\{X_1 - X_2 \leq 4\}$$

using one of the enclosed tables.

$$X_1 - X_2 \sim N(0, (\sqrt{6})^2)$$

$$\text{So, } P(X_1 - X_2 \leq 4) = P\left(\frac{X_1 - X_2}{\sqrt{6}} \leq \frac{4}{\sqrt{6}}\right) = \Phi\left(\frac{4}{\sqrt{6}}\right).$$