SAMPLE PROBLEMS for EXAM II

MATH 526 Applied Math. Stat., 11/18

1. Let $X_1, X_2, ..., X_6$ be a random sample from an $N(3, 4)$ distribution. Find a constant c such that $P(S^2 > c) = .95$ where S^2 is the sample variance of this random sample of size 6.

2. Let X and Y be two independent normal random variables where X has an $N(2, 9)$ distribution and Y has an $N(1, 16)$ distribution. Find $P(X + Y < 5)$.

3. Let X be a random variable with an F distribution with $(5, 3)$ degrees of freedom. Find a constant c such that $P(X < c) = .05$.

4. Let X be a random variable with an $N(2, 4)$ distribution. Find $P(|X - 2|^2 > .36)$.

5. Let Y be a binomial ($b(300, p)$) random variable. If the observed value of Y is $y = 75$ then find a 90 percent confidence interval for p using the Central Limit Theorem approximation.

6. A random sample of size 15 from a normal distribution $N(\mu, \sigma^2)$ yields $\bar{x} = 3.2$ and $s^2 = 4.24$. Find a 90 percent confidence interval for the variance σ^2 when μ is unknown.

7. Two independent random samples of size $n_1 = 16$ and $n_2 = 10$ taken from two independent normal distributions $N(\mu_1, \sigma_1^2)$ and $N(\mu_2, \sigma_2^2)$ respectively yield $\bar{x}_1 = 3.6, s_1^2 = 4.14, \bar{x}_2 = 13.6, s_2^2 = 7.26$. Find a 90 percent confidence interval for σ_1^2/σ_2^2 when μ_1 and μ_2 are unknown.

8. Find a 95 percent confidence interval for the mean μ of a normal population $N(\mu, 4)$ for a random sample of size 16 where $\bar{x} = 3.2$.

9. Let X_1, X_2, X_3, X_4 be a random sample of size four from an $N(1, 16)$ distribution and let $\bar{X}$ be the sample mean of this random sample. Find $P(\bar{X} < 1.5)$.

10. How large a sample is required from an $N(\mu, 1)$ distribution so that a 95% confidence interval has length ≤ 1?

11. Let X_1, X_2, X_3, X_4 be four independent random variables each with the probability density function, f_X, given by

$$f_X(x) = \begin{matrix} 2x & 0 < x < 1 \\ 0 & \text{otherwise} \end{matrix}$$

Find the probability that exactly two of these four random variables exceed $\frac{1}{2}$ and exactly one of these random variables is less than $\frac{1}{4}$.