Score:

Name:
Section (circle one): 1 2 3 4 5 6
Team (circle one): a b c d e f

SM316 – Quiz #6 (Section 8.5-8.7) – Due Wednesday

Take home quiz, open book, open notes. You may work with team members to solve problems, but you may not copy another's work. Calculators are allowed, but you must show all work for full credit.

Note: You may use tables to approximate some of these answers, however, I recommend that you use statistical calculators provided in the applets section of www.sm316.us to get more exact answers.

1. A normal population with an unknown variance has a mean $\mu = 22$. Is one likely to obtain a random sample of $n = 10$ from this population with a mean of $\bar{x} = 25$ and a standard deviation of $s = 3.9$?

use a t-distribution w/ 9 degrees of freedom

$$t = \frac{\bar{X} - \mu}{s/\sqrt{n}} = \frac{25-22}{3.9/\sqrt{10}} = \frac{3\sqrt{10}}{3.9} \approx 2.433$$

$P(t > 2.433) =$

From tables: between .02 and .015

From t-distribution calc = .0189

2. If a certain machine makes electrical resistors with $\mu = 40\Omega$ and $\sigma = 2.5\Omega$, what is the probability that a random sample of 40 resistors will have a combined resistance of more than 1610Ω?

USE NORMAL DISTRIBUTION AND CENTRAL LIMIT THEOREM. $Z = \frac{\bar{X}-\mu}{\sigma/\sqrt{n}}$

$$\sum_{n=1}^{40} x_i \geq 1610 \Rightarrow \bar{X} \geq \frac{1610}{40} = 40.25$$

$$\Rightarrow Z \geq \frac{40.25-40}{2.5/\sqrt{40}} = \frac{(.25)(\sqrt{40})}{2.5} = .6325$$

$$\Rightarrow Pr(Z \geq .6325) \cong 1 - .7357 = .2643$$ (from table)

3. Find the probability that a random sample of 16 observations, from a normal population with $\sigma^2 = 5$, will have a variance s^2 between 4 and 7.

USE χ^2 distribution w/15 degrees of freedom ($\chi^2 = \frac{(n-1)S^2}{\sigma^2}$)

for $S^2 = 4 \Rightarrow \chi^2 = \frac{(15)(4)}{5} = 12$

for $S^2 = 7 \Rightarrow \chi^2 = \frac{(15)(7)}{5} = 21$

$$\Rightarrow Pr(12 \leq \chi^2 \leq 21)$$

$$= Pr(\chi^2 \geq 12) - Pr(\chi^2 \geq 21) = .679 - .1368$$

$$= .5422$$