M583 Old Quiz 3

Math 490 Quiz 5 Fall 2011 Name___________

1) Suppose that

$$\begin{pmatrix} X_1 \\ X_2 \\ X_3 \\ X_4 \end{pmatrix} \sim N_4\left(\begin{pmatrix} 49 \\ 25 \\ 9 \\ 4 \end{pmatrix}, \begin{pmatrix} 2 & -1 & 3 & 0 \\ -1 & 5 & -3 & 0 \\ 3 & -3 & 5 & 0 \\ 0 & 0 & 0 & 4 \end{pmatrix} \right).$$

12 a) Find the distribution of X_2.

$N_1(25, 5)$

12 b) Find the distribution of $(X_1, X_3)^T$.

$N_2\left[\begin{pmatrix} 49 \\ 9 \end{pmatrix}, \begin{pmatrix} 2 & 3 \\ 3 & 5 \end{pmatrix}\right]$

13 c) Which pairs of random variables X_i and X_j are independent?

$X_1 \perp\!\!\!\perp X_4$, $X_2 \perp\!\!\!\perp X_4$, $X_3 \perp\!\!\!\perp X_4$

13 d) Find the correlation $\rho(X_1, X_3)$.

$\dfrac{\text{cov}(X_1, X_3)}{\sqrt{V(X_1)\, V(X_2)}} = \dfrac{3}{\sqrt{2}\sqrt{5}} = \dfrac{3}{\sqrt{10}} = 0.949$

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2) Consider the following data set on Spring 2004 Math 580 total scores.

66.5, 84.1, | 84.6, 84.7, 90.7, 91.8, 93.4, 95.2, | 96.3, 98.5

Consider the CI based on the 25% trimmed mean.

5 a) Find L_n. $\lfloor \frac{n}{4} \rfloor = \lfloor \frac{10}{4} \rfloor = \lfloor 2.5 \rfloor = \boxed{2}$

5 b) Find U_n. $n - L_n = 10 - 2 = \boxed{8}$

5 c) Find the degrees of freedom p $\quad U_n - L_n - 1 = 8 - 2 - 1 = \boxed{5}$

10 d) Find the 25% trimmed mean T_n.

$$\frac{84.6 + \cdots + 95.2}{6} = \frac{540.4}{6} = \boxed{90.067}$$

5 e) Find $d_1, ..., d_{10}$.

84.6 84.6 84.6 84.7 90.7 91.8 93.4 95.2 95.2 95.2

5 f) Find $\overline{d}$. $= \frac{\sum d_i}{n} = \frac{900}{10} = \boxed{90}$

5 g) Find $S^2(d_1, ..., d_{10})$. $= \frac{\sum d_i^2 - n(\bar{d})^2}{n-1} = \frac{81211.98 - 10(90)^2}{9}$

$$= \frac{211.98}{9} = \boxed{23.5533}$$

10 e) Find SE(T_n).

$$V_{SW} = \frac{S^2(d_1, ..., d_n)}{\left(\frac{U_n - L_n}{n}\right)^2} = \frac{23.5533}{\left(\frac{8-2}{10}\right)^2} = 65.42593$$

$$SE(T_n) = \sqrt{\frac{V_{SW}}{n}} = \sqrt{\frac{65.42593}{10}} = \boxed{2.5578}$$

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