

Name Jerry

Student Number _____

STA 302f 2016 Quiz 10

1. (5 points) A forestry company has developed a regression equation for predicting the amount of useable wood that they will get from a tree, based on a set of measurements that can be taken without cutting the tree down. They have a set of ~~more~~ ^{n} more trees they are planning to cut down, and they have measured the independent variables for each tree, yielding $x_{n+1}, \dots, x_{n+m}$. They want to predict the total amount of wood they will get from these trees.

- (a) Let $\hat{w}$ denote the predicted amount of wood. It is calculated using the company's regression data along with $x_{n+1}, \dots, x_{n+m}$. Give a formula for $\hat{w}$. Simplify. Circle your answer.

$$\hat{w} = x'_{n+1} b + \dots + x'_{n+m} b = \left(\sum_{j=1}^n x'_{n+j} \right) b \stackrel{\text{say}}{=} a' b$$

No marks off for not simplifying

- (b) What is the distribution of $\hat{w}$? Show your work. Circle your final answer.

Since $b \sim N_{k+1}(\beta, \sigma^2(x'x)^{-1})$,

$$\hat{w} = a' b \sim N(a' \beta, \sigma^2 a' (x'x)^{-1} a)$$

good enough

or

$$N\left(\left(\sum_{j=1}^n x_{n+j}\right)' \beta, \sigma^2 \left(\sum_{j=1}^n x_{n+j}\right)' (x'x)^{-1} \left(\sum_{j=1}^n x_{n+j}\right)\right)$$

2. (5 points) In your analysis of the trees data, you were asked for a 95% prediction interval for the total volume of wood the company would obtain if they cut down three particular trees. In the space below, write the 95% prediction interval for the total volume of wood. The answer is a pair of numbers, the lower prediction limit and the upper prediction limit. On your printout, circle the numbers and write "Question 2."

$$(57.02, 86.14)$$