

Name \_\_\_\_\_

Student Number \_\_\_\_\_

### STA 431 Quiz 4

1. (5 points) Suppose you estimate the  $m \times 1$  parameter vector  $\boldsymbol{\theta}$  by numerical maximum likelihood, obtaining the vector of MLEs  $\hat{\boldsymbol{\theta}}_n$  and the estimated asymptotic covariance matrix  $\hat{\mathbf{V}}_n$ . Give a  $z$  statistic for testing  $H_0 : \mathbf{a}^\top \boldsymbol{\theta} = 0$ , where  $\mathbf{a}$  is an  $m \times 1$  non-zero vector of constants. Start with the asymptotic distribution of  $\mathbf{a}^\top \hat{\boldsymbol{\theta}}_n$ . Your final answer is a formula for  $z$ . **Circle the formula.**

2. (2 points) Starting with your answer to Question 1, show that for  $H_0 : \mathbf{a}^\top \boldsymbol{\theta} = h$ , the Wald test statistic is  $W_n = z^2$ .

3. (3 points) In Question 3 of this week's assignment, you calculated a 95% confidence interval for the quantity  $2\alpha - \beta$ , where  $\alpha$  and  $\beta$  were the parameters of a beta distribution. Your answer was a set of two numbers, the lower confidence limit and the upper confidence limit. *Write the numbers in the space below.*

On your printout, circle the numbers and write "Question 3" beside them. *Do not answer this question if you do not have a printout.*

**Please attach your printout to the quiz paper. The printout should show your *complete R input and output*.** Make sure your name and student number appear on the printout.