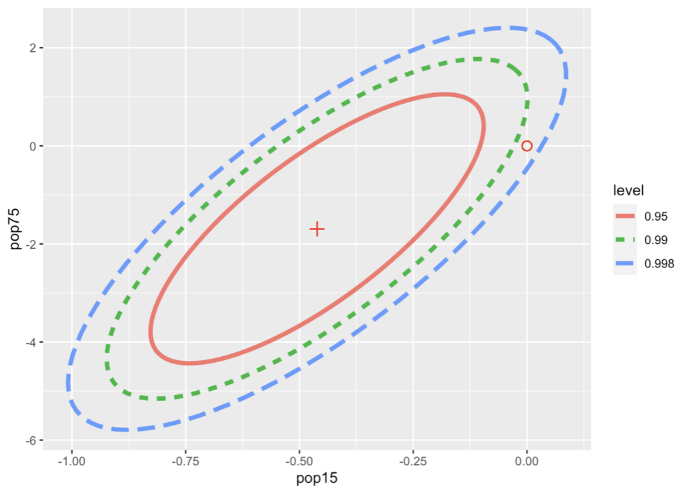
1. "The confidence intervals for individual β_j's are wider than the confidence intervals for the vector β."

   ( ) True. (X) False. ( ) It depends.
   Justification: The vector confidence interval is a family/joint interval for all the betas, so it will be wider than the individual β_j's intervals.

2. Consider the savings dataset from the Faraway library. We fit a model where the response is the savings rate (sr) and the predictors include [pop25] (population under 25) and [pop75] (population over 75). The following plot depicts the confidence region for two variables [pop25] and [pop75]:



   For which hypotheses can you determine the outcome based on the plot above?

   ( ) $H_0 : \beta_{pop75} = \beta_{pop25} = 0$ ( ) $H_0 : \beta_{pop75} = 0$ ( ) $H_0 : \beta_{pop25} = 0$ (X) All of the above. ( ) None of the above.
   Justification: We simply need to look at the plot and determine whether the points:
   – (0,0) i.e. both coefficients are equal to zero
   – pop15 = 0, i.e. the $\beta_{pop15} = 0$
   – pop75 = 0, i.e. the $\beta_{pop75} = 0$
   So, we can quickly test all these hypotheses visually.

3. The standard error for the estimated mean response $\hat{\mu^*}$ given a new observation x^* is always larger than the predicted value y^* given a new observation x^*.

   ( ) True. (X) False.
   Justification: If we look at the standard error formulas, we will see that the prediction error is always larger than the estimation error.

4. The point estimate for the mean response μ^* given a new observation x^* is equal to:

   (X) $(x^*)^T\hat{\beta}$
   ( )$X^T\hat{\beta}y$
   (X) $(x^*)^T(X^TX)^{-1}Xy$

(X) the best estimate for y^* at a future x^*.
( ) none of the above
Justification: The first is the formula for the μ^*. The third one is the same formula, if we plug-in the $\hat{\beta}$, the 4th choice is the exactly what the estimator we calculate is using words.

5. The standard error of $\hat{\mu}^*$ converges (as the sample size increases) to

   ( ) σ ( ) $\hat{\sigma}$ ( ) σ^2 ( ) $\hat{\sigma}^2$ (X) 0 ( ) none of the above.
   Justification: Recall from the lectures that the limit of the standard error for estimation is zero. (In statistics jargon such estimators are called *consistent*.

6. The variance of $\hat{y}^*$ converges (as the sample size increases) to

   ( ) σ ( ) $\hat{\sigma}$ (X) σ^2 ( ) $\hat{\sigma}^2$ ( ) 0 ( ) none of the above.
   Justification: Recall from the lectures that the limit of the variance for prediction is σ^2.

7. If I want to use Bonferroni correction to construct the confidence interval for $x_1^*, \ldots, x_4^*$, in order for the family confidence level to be 0.95, I should divide $\alpha = 0.05$ by

   ( ) 1 ( ) 2 (X) 4 ( ) 8 ( ) none of the above.
   Justification: 4 is the number of points for which I want to construct the interval.