A practice question based on 2018 Quiz 6

In a study of the Canadian work force, we seek to predict marital status from $x_1 =$ Age and x_2 an indicator for Sex, with $x_2 = 1$ meaning female and $x_2 = 0$ meaning male. Age is centered by subtracting off the mean for the entire sample, so that a person of "average" age has $x_1 = 0$. Marital status is coded as (1) Single and never married, (2) Married, (3) Divorced or separated, and (4) Widowed, meaning the husband or wife is dead.

1. Write the equations for a multinomial logit model in the space below. Make "Single and never married" the reference category that goes in the denominator of the generalized logits.

2. Write the π_j symbols from your model so we know what they mean.

   $P(\text{Single and never married}) =$ $P(\text{Married}) =$

   $P(\text{Divorced or separated}) =$ $P(\text{Widowed}) =$

3. In terms of the β_{ij} symbols from your model, what null hypothesis would you test to determine whether being married (as opposed to single and never married) is related to gender?

4. Suppose you rejected $H_0 : \beta_{23} = 0$, with $\widehat{\beta}_{23} > 0$. State the conclusion in plain, non-statistical language.

5. Suppose you want a single test of whether, controlling for gender, marital status is related to age. In terms of the β_{ij} symbols from your model, what is the null hypothesis?

6. In terms of the β_{ij} symbols from your model, what is the probability that a man of average age is single and never married?

7. What is the meaning of $\beta_{01} = \beta_{02} = \beta_{03} = 0$?