Formulas for exam 2:

logistic regression model \( \pi = \frac{e^{\alpha + \beta x}}{1 + e^{\alpha + \beta x}} \)

logistic regression model \( \log(\frac{\pi}{1-\pi}) = \alpha + \beta x \)

\( \hat{\pi} = 0.5 \) at \( x = -\hat{\alpha}/\hat{\beta} \)

incremental rate of change \( = \hat{\beta}\hat{\pi}(1 - \hat{\pi}) \)

multiple logistic regression model

\[
\logit(\pi) = \alpha + \beta_1 x_1 + \cdots + \beta_k x_k \\
\pi = \frac{e^{\alpha + \beta_1 x_1 + \cdots + \beta_k x_k}}{1 + e^{\alpha + \beta_1 x_1 + \cdots + \beta_k x_k}}
\]

Wald statistic is \( z = \hat{\beta}/SE \) or \( z^2 \)

LR statistic \( = -2(L_0 - L_1) = \) change in deviance

Standardized residual \( = (\text{observed} - \text{fitted})/SE \)

Baseline-category logit model: \( \log[P(Y = j)/P(Y = J)] = \alpha_j + \beta_j x \)

\[
P(Y = j) = \frac{e^{\alpha_j + \beta_j x}}{1 + e^{\alpha_1 + \beta_1 x} + \cdots + e^{\alpha_{J-1} + \beta_{J-1} x}}, \quad j = 1, 2, \ldots, J - 1.
\]