1. The domain (input) of the binomial regression link function $g(p) = \log\left(\frac{p}{1-p}\right)$ is the interval $[0, 1]$.

True

False

2. The "probit" link function is $\eta = \Phi^{-1}(p)$, where Φ^{-1} is the inverse of the standard normal cdf, p is the probability of success from the binomial response, and η is the linear predictor.

True

False

3. The likelihood function for binomial regression is the joint pmf of the response, but interpreted as a function of the parameters of the model (with the response data fixed).

True

False

4. The likelihood function and the log-likelihood function:

both have the same maximum value.

are both maximized at the same input/parameter value.

5. Let event E have probability p of occurrence. Then the *odds in favor of* E is defined as: $\frac{p}{1-p}$.

True

False

6. Ssuppose that the probability of contracting a virus v is $p = 0.1$. What are the odds of contracting v?

9

$1/9$

11

$1/11$

7. Consider data on the survival of patients who had undergone surgery for breast cancer. The data consists of a response (survival status after five years) and two predictors (the age of the patient at the time of the operation, and the number of cancerous auxiliary nodes detected):

1. x_1: Age of patient in years at time of operation (**predictor**)
2. x_2: Number of cancerous axillary nodes detected (**predictor**)
3. Y_i: Survival status (**response**): 0 = the patient survived 5 years or longer; 1 = the patient died within 5 year

Suppose that a logistic regression model, *with standardized predictors*, correctly fits the data:

$$\eta = \beta_0 + \beta_1 z_1 + \beta_2 z_2 = \log\left(\frac{p}{1-p}\right),$$

where p is the probability of a patient surviving 5 years or longer, and

$$z_j = \frac{x_j - mean(x_j)}{sd(x_j)} \text{ for } j = 1, 2.$$

Which of the following are correct?

β_0 represents the mean log odds of surviving 5 years or longer for a person of (sample) mean age, and with the (sample) mean number of cancerous axillary nodes detected.

For a fixed number of cancerous axillary nodes detected, a one standard deviation increase in age increases the odds of survival beyond 5 years by a multiplicative factor of e^{β_1}, on average.

β_0 represents the mean log odds of surviving 5 years or longer for a person of minimum age and with no cancerous axillary nodes detected.

For a fixed number of cancerous axillary nodes detected, a one standard deviation increase in age increases the log-odds of survival beyond 5 years by β_1, on average.

For a fixed number of cancerous axillary nodes detected, a one year increase in age increases the log-odds of survival beyond 5 years by β_1, on average.

8. Consider a logistic regression model that uses data to estimate the probability that a client will default on a monthly credit card payment (defaulting on a payment means that the client fails to pay their bill by the deadline for the month in question.)

1. x_1: credit limit in dollars (**predictor**)
2. x_2: dollar amount of the bill statement one month prior (**predictor**)
3. x_3: dollar amount of the bill statement for two months prior (**predictor**)
4. x_4: dollar amount of the payment one month prior (**predictor**)
5. x_5: dollar amount of the payment two months prior (**predictor**)
6. Y_i: default status (**response**): 0 = the client did not default on the payment for the month in question 5; 1 = the client did default on the payment for the month in question.

Suppose that a logistic regression modelcorrectly fits the data:

$$\eta = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 = \log\left(\frac{p}{1-p}\right),$$

where p is the probability of default.

$\beta_1/1000$ is the average log-odds of default for a one-thousand dollar increase in credit limit, adjusting for the prior two months' bill statement and payment amounts.

e^{β_0} represents the mean odds of defaulting on a payment for a person with a \$0 credit limit, a \$0 bill statement for the last two months, and \$0 in payments for the last two months.

β_0 represents the mean log-odds of defaulting on a payment for a person with a \$0 credit limit, a \$0 bill statement for the last two months, and \$0 in payments for the last two months.

e^{β_1} is the average odds of default for a one-thousand dollar increase in credit limit, adjusting for the prior two months' bill statement and payment amounts.