1. 
   a) Plot the logistic response function \( \ln\left(\frac{\mu}{1-\mu}\right) = \beta_0 + \beta_1 x \) when \( \beta_0 = -25 \) and \( \beta_1 = 0.2 \).
   
   b) For what value of \( x \) is the mean response equal to 0.5?
   
   c) Find the odds when \( x = 150 \) and when \( x = 151 \). Is the odds ratio equal to \( \exp(\beta_1) \)?

2. A local health clinic sent fliers to its clients to encourage everyone, but especially older persons at high risk of complications, to get a flu shot in time for protection against an expected flu epidemic. In a pilot follow-up study, 50 clients were randomly selected and asked whether they actually received a flu shot. In addition, data were collected on their age \( (x_1) \) and their health awareness. The latter data were combined into a health awareness index \( (x_2) \), for which higher values indicate greater awareness. A client who received a flu shot was coded \( y = 1 \), and a client who did not receive a flu shot was coded \( y = 0 \). The logistic model

\[
\ln\left(\frac{\mu}{1-\mu}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_1 x_2
\]

is assumed to be appropriate. The data is given in the course webpage.

   a) Find MLE of \( \beta_0, \beta_1, \beta_2, \) and \( \beta_3 \). State the fitted response function.

   b) Obtain \( \exp(\hat{\beta}_1) \). Does this number have a ready interpretation? Explain.

   c) What is the estimated probability that clients aged 55 with a health awareness index of 60 will receive a flu shot?

   d) Test the goodness-of-fit of the model.

   e) Obtain a 95% CI for the odds of flu shot for clients of age 45 with a health awareness index of 60.