Biology 4605/7220 Name_____Key_____
Quiz #7b 29 October 2003

1. In 1991 the price received by dairy producers in Massachusetts had fallen dramatically and producers argued they would soon be out of business without state intervention. An economist at the University of Massachusetts was asked to evaluate how many dairy producers would go out of business in the near future without some form of assistance.
a. State how a decline in the price of milk (*prMilk*) is expected to affect the number of producers (*nProd*)?

Expect decline in prices to reduce the number of producers.

b. The economist developed a model to forecast the numbers of dairy farms (*nProd*) that would remain under alternative price scenarios.

$$nProd = \beta_o + \beta_{prMilk}\, prMilk + \beta_{prFeed}\, prFeed + \beta_{prEquip}\, prEquip + \varepsilon$$

where *prEquip* is the price index for machinery and *prFeed* is the price index for feeds.

Based on your answer in **a.** above, will β_{prMilk} be positive or negative ? _negative___

Will β_{prFeed} be positive or negative ? _negative___ Why?

Expect increase in price of feed to reduce number of farms by driving some out of business.

Source	df
prMilk	1
prFeed	1
prEquip	1
error	16
total	19

c. Assuming data from 20 years, fill out the first two columns of the ANOVA table.

2 A General Linear Model assumes normal errors. In contrast, the General***ized*** Linear Model allows one to use non-normal errors. Generalized Linear models are written as follows.

Identity Link: $Response = \mu + \varepsilon$

Log Link: $Response = e^{\mu} + \varepsilon$

Logit Link: $\frac{p}{1-p} = e^{\mu} + \varepsilon$

where ϵ is the error model and
μ is the systematic or structural model ($\beta_o + \beta_1 X_1 + \beta_2 X_2 \ldots$ *etc)*

What is the link for the *nProd* model ? _____log___

3 The symbol p represents the proportion of farms going out of business in any one year. Write a general***ized*** linear model to evaluate whether the odds ($p/(1-p)$) of a farm going out of business depend only on milk prices.

$$Odds = \frac{p}{1-p} = e^{\left(\beta_o + \beta_{pMilk}\, pMilk\right)} = e^{\left(\beta_o\right)}\, e^{\left(\beta_{pMilk}\, pMilk\right)}$$