Biology 4605 / 7220 Name _____
Quiz #6a 23 October 2007

1. Acording to Plotkin *et al.* (2000, *Proc. Natl. Acad. Sci* 97: 10850-10854) the number of tree species in a plot of area A in a tropical forest is:

$$S = S(1\ ha) \cdot A^{z} \cdot e^{-kA}$$

In the Pasoh forest reserve (Malaysia), z = 0.125 and k = $-5.66 \cdot 10^{-4}$.

In the Mudumalai Wildlife Sanctuary (India), z = 0.161 and k = $-5.41 \cdot 10^{-4}$.

If S(1 ha) = 200 species, then compute the number of species expected in plots of area A=4 ha in the Mudumalai sanctuary. S = _____[2]

The parameter k is small, and hence as an approximation can be taken as zero: $e^{-kA}=1$. Compute the approximate number of species S_{Approx} in plots of A=4 ha if k assumed to be zero. S_{Approx} = _____[2]

Report the approximation relative to your first computation as a ratio.

Ratio = (S_{Approx} / S) = _____[1]

2. If we define lnR = ln(S(A) / S(A=1ha), then

$$\ln R = z \cdot \log_e(A) + k \cdot A$$

Write the H_o/H_A pair for the testing whether the parameter z differs from zero. [2]

3a. For the following general linear model (ANCOVA) write in below each term the degrees of freedom, where the categorical variable *Location* consists of three sites and there are 36 observations. [5]

$$\ln R - \beta_0 = \beta_{Loc} \cdot Location + \beta_A \cdot \ln A + \beta_{A*Loc} \cdot \ln A \cdot Location + \text{error}$$

3b. Complete an ANOVA table for this ANCOVA, where the SS for the regression variable is 100, the SS for the categorical explanatory variable *Location* is 400, the SS for the interaction term is 600, the SS for the error is 600, and there are 36 observations that contribute to the total degrees of freedom. [MS: 1]
[F: 1]