

LINEAR MODELING EXERCISES

ANALYSIS OF VARIANCE

- 1) Examine the residuals (observed value less fitted value) from fitting a main effects only model to the **weightgain** data. What conclusions do you draw?

LINEAR MODELING

- 1) The **R** data frame **warpbreaks** gives the number of **breaks** per fixed length of wool during weaving, for two different **wool** types, and 3 different weaving **tensions**. Using a linear model, establish whether there is evidence that the effect of tension on break rate is dependent on the type of wool. If there is, use **interaction.plot()** function to examine the nature of the dependence.
- 2) The **R** data frame **cars** contains data about the stopping distance and speed of cars when the driver was signaled to stop. It takes a fixed reaction time for drivers to apply their brakes, so the car will travel a distance directly proportional to its speed before beginning to slow. However, an automobile's kinetic energy is proportional to the square of its speed, but the brakes can only dissipate that energy, and slow the car, at a constant rate per unit distance traveled.

Fit three different linear models to this data. Report the results.

- a) $\text{dist} \sim \beta_0 + \beta_1(\text{speed}) + \beta_2(\text{speed}^2) + e$
- b) $\text{dist} \sim \beta_1(\text{speed}) + \beta_2(\text{speed}^2) + e$
- c) $\text{dist} \sim \beta_1(\text{speed}) + e$

Which model seems to fit better? Why?