1. **(1 pt) mathbioLibrary/setABiocLabs/Lab121_D3_dog_study.pg**
Because of the accuracy of WebWork, you should use 5 or 6 significant figures on all problems.

A collection of dogs were measured and weighed producing the following table of data [1]. (Note that the length is from nose to anus.)

Length (cm)	Body Weight (gm)	Surface Area (cm^2)
50	3520	2290
61	5270	3185
73	5520	3700
78	10240	5150
97	17220	8080
100	26320	8930
105	33250	10720

a. The first model examines Weight, w, as a function of the Length, u. Use Excel's Trendline with the Power law to find the best fit to the data for a model of the form:

$$w = ku^a.$$

The best fit coefficients, k and a, found by Excel are
$k =$ _____.
$a =$ _____.
Determine the sum of square errors between the weight model and the data.
Sum of Square Errors = _____.
If we assume that this model gives the ideal weight for a dog, then a dog with a length of 73 cm should weigh
Weight of 73 cm dog = _____ gm.
Assuming this model gives the best value, compute the percent error that the 73 cm dog in the table varies from the ideal dog in weight.
Percent Error (weight) for 73 cm dog = _____ .
Suppose a dog has a length of 100 cm, then according to the model should weigh
Weight of 100 cm dog = _____ gm.
Again, assuming this model gives the best value, compute the percent error that the 100 cm dog in the table varies from the ideal dog in weight.
Percent Error (weight) for 100 cm dog = _____ .
Suppose you have a dog that weighs 13320 gm. According to the model, what would you predict would be its length?
Length of 13320 gm dog = _____ cm.

b. In your Lab report create a plot of this best fitting curve with the data. What are the appropriate units for the coefficient k? Write a brief paragraph to explain why the coefficient a has the value it does when fitting the weight data for the dogs.

c. Repeat the process in Part a for the surface area data, s, as a function of length, u. In this case the model satisfies the allometric model:

$$s = ku^a,$$

where the coefficients k and a differ from Part a. The best fit coefficients, k and a, found by Excel are
$k =$ _____.
$a =$ _____.
Determine the sum of square errors between the surface area model and the data.
Sum of Square Errors = _____.
If we assume that this model gives the ideal surface area for a dog, then a dog with a length of 73 cm should have a surface area
Surface area of 73 cm dog = _____ cm^2
Assuming this model gives the best value, compute the percent error that the 73 cm dog in the table varies from the ideal dog in surface area.
Percent Error (surface area) for 73 cm dog = _____ .
Suppose a dog has a length of 100 cm, then according to the model should have a surface area
Surface area of 100 cm dog = _____ cm^2 .
Again, assuming this model gives the best value, compute the percent error that the 100 cm dog in the table varies from the ideal dog in surface area.
Percent Error (surface area) for 100 cm dog = _____ .
Suppose you have a dog that has a surface area 6765 cm^2. According to the model, what would you predict would be its length?
Length of 6765 cm^2 dog = _____ cm.

d. In your Lab report create a plot of this best fitting curve with the data. What are the appropriate units for the coefficient k? Write a brief paragraph to explain why the coefficient a has the value it does when fitting the surface area data for the dogs.

[1] J. Mazumdar (1989), An Introduction to Mathematical Physiology and Biology, Australian Mathematical Society Lecture Note Series, Cambridge University Press, Cambridge.