## Math 1311
## Section 5.3
## Modeling Data with Power Functions

In this section, we will learn how to construct power function models much as we did linear and exponential models in the preceding chapters.

**Example 1: Stopping Distance**

The table below shows the average distance $D$, in feet, for a car on dry pavement versus the speed $S$ of the car, in miles per hour.

| **S = speed (mph)** | 15 | 25 | 35 | 40 | 60 | 75 |
|---|---|---|---|---|---|---|
| **D = stopping distance (feet)** | 44 | 85 | 136 | 164 | 304 | 433 |

a. Find a model of stopping distance as a power function of speed.

b. If speed is doubled, how is stopping distance affected?

c. Plot the data and power model on the same screen.

**Example 2:** Table below gives the length $L$, in inches, of a flying animal and its maximum speed $F$, in feet per second, when it flies.

| **Animal** | **Length *L*** | **Flying speed *F*** |
|---|---|---|
| Fruit fly | 0.08 | 6.2 |
| Horse fly | 0.51 | 21.7 |
| Ruby-throated hummingbird | 3.2 | 36.7 |
| Willow warbler | 4.3 | 39.4 |
| Flying fish | 13 | 51.2 |
| Bewick's swan | 47 | 61.7 |
| White pelican | 62 | 74.8 |

a. Judging on the basis of the table, is it generally true that larger animals fly faster?

b. Find a formula that models $F$ as a power function of $L$.

c. Make the graph of the function in part b

d. Is the graph concave up or concave down? Explain in practical terms what your answer means.

e. If one bird is 10 times longer than another, how much faster would you expect it to fly?

**Choosing a model.**

**Example 3:** Which model does each example suggest? A Linear, exponential, logistic, or a power function?

a. In examining broad jump records at your university, you find that over each 5-year period the school record increase by 2 inches.

b. Records show that if a speed of an automobile is multiplied by $t$, then the stopping distance is multiplied by a fixed power of $t$.

c. A rumor is spreading, and you find that each day the number of people who have heard the rumor is 50% larger than the day before.

d. Suppose the rumor from part c is spreading across your college campus but will never spread beyond the limits of the campus. How might this new information alter your choice of model?