Pre-calculus
3-2a
11/3/07

Warm-up

$x=0$ In 1980, the population of Spokane was 171,300 people.
In 1990, the population of Spokane was 177,196 people.
In 2000, the population of Spokane was 195,629 people.

$f(x) = a \cdot b^x$ population x years after 1980

Model Spokane's population with an exponential function and predict the population in 2006.

$f(x) = 171300\, b^x$

$195629 = 171300\, b^{20}$

$(1.142)^{1/20} = (b^{20})^{1/20}$

$1.0067 = b$

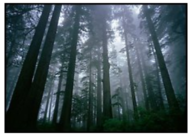
$f(x) = 171300(1.0067)^x$

$f(20) = 195,776$

$f(26) = 203,779$

Spokane's official estimate for 2006 was 198,081 people.

Logistical Modeling



California's Redwood trees can grow to heights of 380 feet and an age up to 2200 years.
When transplanted from a nursery, saplings are 3 feet tall. After 20 years, the tree is already 65 feet tall. Most of the pines in our area are 60 to 100 feet tall.

Model and sketch the Redwood's growth with a logistic function.

$$f(x) = \frac{c}{1 + \underbrace{a \cdot b^x}_{\text{Exp function}}} \leftarrow \text{limit to growth (380 ft)}$$

$$3 = \frac{380}{1 + a \cdot b^0}$$

$$3 = \frac{380}{1+a}$$

$$a = \frac{380}{3} - 1$$

$$a = 125.7$$

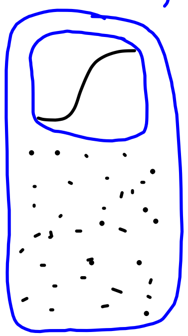
$$f(x) = \frac{380}{1 + 125.7\, b^x}$$

$$65 = \frac{380}{1 + 125.7\, b^{20}}$$

$$\left(b^{20}\right)^{1/20} = \left(\frac{\frac{380}{65} - 1}{125.7}\right)^{1/20}$$

$$b = .85$$

$$f(x) = \frac{380}{\left(1 + 125.7(.85)^x\right)}$$



Xmin 0
Xmax
ymin 0
ymax 400

Title: Dec 3-7:29 AM (2 of 4)

Logistic funtions

What is the variable?

What are the constants?

How much information do you need to model something logistically?

Are you Logistic?

$$f(x) = \frac{71}{1 + a \cdot b^x}$$

Age	Ht
0	21
17	69

71 max

13 60

~~How tall/long were you when you were born?~~

$$21 = \frac{71}{1+a} \qquad a = 2.38$$

~~What is your predicted full height?~~

$$69 = \frac{71}{1+2.38b^{17}} \qquad b = .77$$

~~What was your height at one other time in your life?~~

$$f(x) = \frac{71}{1+2.38(.77)^x}$$

$$f(13) =$$