Review

Describe the end behavior using limits:

\[ f(x) = 2^{-3x} \text{ Decay} \]
\[ \lim_{x \to \infty} f(x) = \infty \]
\[ \lim_{x \to -\infty} f(x) = 0 \]
\[ f(x) = 0.85^{-x} \text{ Growth} \]
\[ \lim_{x \to -\infty} f(x) = 0 \]
\[ \lim_{x \to \infty} f(x) = \infty \]

Word Problems:

1. Tell yourself: "I CAN do this"
   "I'm a Boss"
2. Read the problem [All of the words]
3. Determine what the problem wants you to answer.
4. Find (list) given information
5. Use given information to solve problem
3.2 Exponential Modeling

What is the initial value and percent of increase or decrease?

\[ f(x) = 52 \cdot 1.15^x \quad \text{IR: 52 increase } 15\% \]

\[ f(x) = 5 \cdot 0.85^x \quad \text{IR: 5 decrease } 15\% \]

\[ f(x) = a_0 \cdot b^x \]

\[ f(x) = a_0 \cdot (1 \pm r)^x \]

When looking at percent increase or decrease - the base is expressed as 100% + or - the % change.

Is this an increase or decrease?

By what %?
The initial value is 4 and the population is increasing by 3%. Write an exponential equation.

\[ f(x) = 4 \cdot (1.03)^x \]

When will the population reach 10?

\[ 10 = 4 \cdot (1.03)^x \]

Graph
\[ y = 10 \quad y = 4 \cdot (1.03)^x \]
Find intersection \( \approx 30.998 \)

\[ A = a_0 \cdot (b)^{\frac{t}{n}} \]

- \( A \): the amount after a given period of time
- \( a_0 \): the initial amount
- \( t \): time
- \( n \): the life cycle of the behavior
- \( b \): type of behavior (doubling, half life, etc.)

If you have the life cycle of a given behavior then use this formula.
You have 5 grams of a substance that has a half life of 20 days.

\[ A = a_0 \cdot (b)^{\frac{t}{20}} \]

\[ A = 5 \cdot \left(\frac{1}{2}\right)^{\frac{t}{20}} \]

How much do you have in 15 days?

\[ 5 \cdot \left(\frac{1}{2}\right)^{\frac{15}{20}} \approx 2.97 \text{ grams} \]

When will you have less than 2 grams?

\[ 2 \leq 5 \cdot \left(\frac{1}{2}\right)^{\frac{t}{20}} \approx 26.4 \text{ days} \]

Atmospheric Pressure:

\[ P(h) = 14.7 \cdot \left(\frac{1}{2}\right)^{\frac{h}{3.6}} \]

P pounds per square inch

h height in miles

14.7 initial pressure (sea level)
Exponential Regression

A process of fitting a set of data to an exponential equation.

<table>
<thead>
<tr>
<th>Year</th>
<th>Value</th>
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<tbody>
<tr>
<td>1900</td>
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<td>2000</td>
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<td>2003</td>
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</tbody>
</table>

Step 1: \( \text{STAT} \Rightarrow \text{EDIT} \rightarrow L_1 \div L_2 \)

Step 2: \( \text{2nd Stat Plot} : \text{Turn Plot 1 ON} \)

Step 3: \( \text{STAT} \Rightarrow \text{CALC} \Rightarrow 0 \text{ EXPRE G} \)
\( 2 \text{ Na 1} (L_1), 2 \text{ Na 2} (L_2), \)

Equation: \( \text{VARS} \Rightarrow \text{Y} \rightarrow \text{VARS} \Rightarrow \text{Y1} \) \( \text{E} \text{N} \text{B} \)

Compare the result with 2003.

\( \text{EXPR E G} \rightarrow L_1, L_2, Y_1 \)