12.6 - Building and Using Exponential Models

*Questions so far on assignments
*Reminder of Building Exponential Models
*Looking back at Problem 11.1
*Building and Using Exponential Models
*Assignment Time - look at rest of week

Packet 12 Questions
Building Exponential Models

Remember that the two constants of an exponential model are $A_0$ and $b$.

If a model is known to be exponential, only two "points" are needed to create the model.

Use a ratio of the two "points" to solve for $b$, then go back and solve for $A_0$.

or...

with two known points $(s, t)$ and $(r, w)$

\[
\frac{b^s}{b^r} = \frac{t}{w}
\]

\[
f(x) = A_0 b^x
\]

which with our power properties, can be solved for $b$.

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12.4a: Solving Exponential Equations

*In general, this is similar to "undoing operations" with the understanding of...

A logarithm is the operational inverse of an unknown exponent.

To solve algebraically
- Work to get variable "term" isolated

  - If the variable is in the exponent, take the appropriate base log of both sides

  - Use log properties and other equation solving techniques to now solve
Example (11.1) \( 1940 \Rightarrow t=0 \)

In 1968 the US minimum wage was $1.60 per hour. In 1976, the minimum wage was $2.30 per hour. Assume the minimum wage can be modeled with exponential growth, find the year in which the minimum wage passed $5.00. When will it pass $20.00 per hour?

\[
\begin{align*}
(8, \ 1.60) & \quad (16, \ 2.30) \\
\frac{b^{16}}{b^8} & = \frac{2.30}{1.60} \\
\log b & = 1.375 \\
b & = 1.0464078 \\
A(t) & = A_0 \left(1.0464078\right)^t \\
1.60 & = A_0 \left(1.0464078\right)^8 \\
1.60 & = A_0 (1.4375) \\
1.13043 & = A_0 \\
A(t) & = 1.13043 \left(1.0464078\right)^t
\end{align*}
\]

Example (11.1)

In 1968 the US minimum wage was $1.60 per hour. In 1976, the minimum wage was $2.30 per hour. Assume the minimum wage can be modeled with exponential growth, find the year in which the minimum wage passed $5.00. When will it pass $20.00 per hour?

\[
A(t) = 1.13043 \left(1.0464078\right)^t
\]

\[t \approx 63.67798 \]

\[2023 \]
Assignment (Packet Due Friday, February 5)

1) Chapter 12 Problems Packet
   a) 12.1 / 12.3 / 12.8 / 12.4 / 12.5
   b) 12.6 / 12.7

*) Make sure you are showing ALL operations/work

2) Should have already turned in Money problems

3) All Unit 12 grades will be entered for Semester 2