**Algebra II Module 8 Lesson 13 – Solving Contextual Exponential Equations**

1. Your baby brother, Zach, is starting to talk and you start keeping a list of how many words he knows. When Zach was 12 months old, he had a vocabulary of 25 words and the list of words increases exponentially at a rate of 5% per *week*. Do you expect him to have a vocabulary of at least 300 words by his next birthday? Explain your answer.

(Hint: Write an exponential function and evaluate that function for *x* = 52 since there are 52 weeks in a year.)

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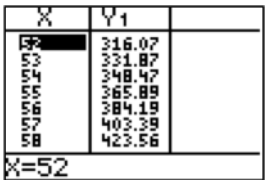
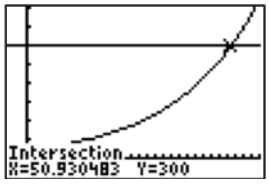
| **A** No. Zach will only have 285 words in his vocabulary. | Incorrect. A *linear* function, $y = 25 + 5x$, was used to model the growth for $x = 52$, then you would get 285 words. |
| **B** No. Zach will only have less than 30 words in his vocabulary. | Incorrect. The correct exponential equation $y = 25(1 + 0.05)^x$ was used but 2 was substituted in for *x*, thinking Zach would be 2 years old. The growth rate is per *week*. |
| **C** There is not enough information to make a determination. | Incorrect. There is enough information. |
| **D** Yes. Zach's vocabulary will exceed 300 words by the time he turns two. | Correct. The following functions were entered into the calculator: $y_1 = 25(1 + .05)^x$ and $y_2 = 300$.<br>Using the table, after 52 weeks, Zach's vocabulary would exceed 300 words:<br>  <br><br>Using the multi-graph method, Zach's vocabulary will reach 300 words in under 51 weeks:<br>  <br> |