Math 1332: Worksheet 3

September 22, 2021

Name: _____

1. Three friends, Xena, Yvonne, and Zoe, collect sports memorabilia. For each of them, the size of their collection grows according to linear growth, buying new items at a rate which is constant over time.

   (X) In 2010 Xena had 12 items in her collection, and in 2012 she had 18. Write a formula which describes her total number T_n of items with respect to the number of years n since 2010. How many items will she have in 2022?

   (Y) In 2010 Yvonne had 22 items in her collection, and in 2011 she had 25. Write a formula which describes her total number T_n of items with respect to the number of years n since 2010. What year did Yvonne start her collection, getting her first item(s)? How many items did she start off her collection with?

   (Z) In 2010 Zoe had 2 items and in 2022 she had 38 items. Write a formula which describes her total number T_n of items with respect to the number of years n since 2010.

   (T) Write a formula which describes the total number of items across all three friends with respect to the number of years since 2010.

2. A space-faring alien species has effectively unlimited resources, since they can travel faster than light to find what they need. As such, their population grows exponentially with no long-term check on the size. Their calendar is measured in centuries. At century 0 their population was 1 trillion. Each century their population doubles.

    (a) Write a formula which describes their total population T_n in terms of the number of centuries n since century 0.

    (b) How large is their population after 100 years? After 200 years? After 500 years?

    (c) How long will it take for their population to exceed 1 quadrillion (= 1000 trillion)?

    (d) How long will it take for their population to exceed 1 quintillion (= 1000 quadrillion)?

    (e) How long will it take for their population to exceed 1 sextillion (= 1000 quintillion)?