2/6/2026 Spring 2026, Patterns in (Environmental) Math Quiz 3 Solutions Sitaraman

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1. (10 points) Solar panels at a home cost 10000 dollars to install and paid back 1200 a year in savings. Write the net expenditure (cost minus savings) after x years as a linear function $C(x)$. How many years before the net expenditure becomes zero?

   Solution:

   After x years savings is $1200x$. So $C(x) = 10000 - 1200x$.When $C(x) = 10000 - 1200x = 0$ we get $10000 = 1200x$. Solving for x we get $x = 100/12 = 8 + (1/3)$ years or 8 years and 4 months or approximately 8.33 years. (Actual number has a repeating 3: it is 8.33333....)

2. (20 points) For the sequence $3, 8, 13, 18, ...$ do the following:

   1. Explain why it is an arithmetic sequence and find the common difference.
   2. Write a formula for the n-th term a_n and use it to find a_{100}.
   3. Find the sum for the first 100 terms of the sequence using the formula $\frac{a_1 + a_n}{2} \times n$.

   (Put $n = 100$ in formula).

   Solution:

   It is an arithmetic sequence because each time you add 5 which is the common difference.

   $a_n = a_1 + (n-1)d = 3 + (n-1)5 = 5n - 2$. Put $n = 100$ to get $a_{100} = 498$.

   The sum $a_1 + a_2 + ... + a_{100} = 3 + 5 + 8 + ... + 498 = ((3+498)/2)(100) = 501 \times 50 = 25050$.