UNIT 4 • MODELING AND ANALYZING EXPONENTIAL FUNCTIONS
Lesson 2: Domain and Range of Exponential Functions

Problem-Based Task 4.2.1: Pine Trees upon the Highland

SMP
1 ✓ **2** ✓
3 ✓ **4**
5   **6** ✓
7 ✓ **8**

The mountain hemlock, known by the scientific name *Tsuga mertensiana*, is a type of pine tree that grows on the west coast of the United States, especially in Alaska. Mountain hemlocks grow in height every year, and can live to be over 800 years old. The following functions estimate the maximum and minimum heights, in feet, that a single tree on a certain ridge might reach after x years of growth.

- Maximum: $f(x) = -140 \cdot 1.006^{-x} + 140$

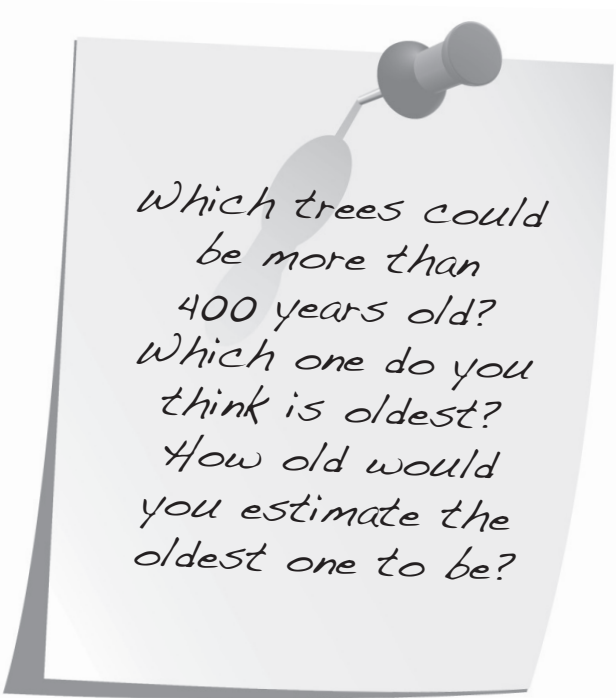- Minimum: $g(x) = -90 \cdot 1.009^{-x} + 90$

You are surveying a grove of five hemlocks with different ages and heights. The heights are listed in the following table.

Tree 1	96 feet
Tree 2	72 feet
Tree 3	120 feet
Tree 4	139 feet
Tree 5	80 feet

Which trees could be more than 400 years old? Which one do you think is oldest? How old would you estimate the oldest one to be?

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