Name: Date:

Practice: Interpreting Logarithmic Models A

Use the following information to complete problems 1–3.

> An aerial photograph of a section of undeveloped land documents the growth of a rapidly growing ground plant called kudzu over a 10-year period. A statistician estimates that the spread of the plant over the 10-year period can be modeled by the logarithmic function $A(t) = -18.5 + 30.5 \bullet \ln t$, where A is the acreage covered by kudzu and t is the number of years.

1. What is the value of $A(1)$, and what meaning does it have in the context of this problem?

2. What is the domain of the function?

3. What is the range of the function?

Use the given information to complete problem 4.

4. The manufacturer of a brand of orange juice would like to decrease the acidity of the original product and market the low-acid version in special health food markets. If the original juice has a pH of 3.25, and the manufacturer wants to cut the acid-producing substances in the juice in half, what will the pH of the resulting product be? (*Note*: pH = $-\log c$, where c is the concentration of hydronium or "acid" ions.)

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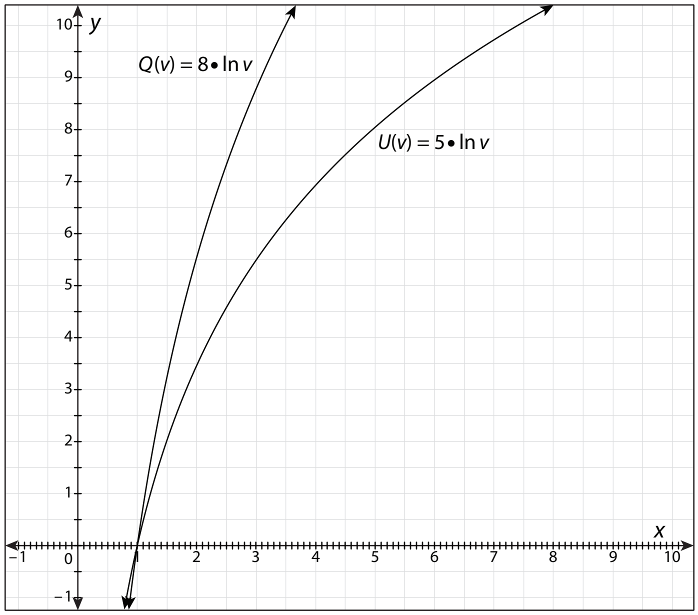
The graph shows the work done by a mechanic's pneumatic car lift at two different temperatures. Use the graph to complete problems 5 and 6.



5. Draw a vertical line on the graph that represents the difference between the work function at the lower temperature, $U(v) = 5 \bullet \ln v$, and the work function at the higher temperature, $Q(v) = 8 \bullet \ln v$, at a domain value of $v = 2$ where v is the volume of the liquid-compression chamber of the car lift.

6. Without using a calculator, write and simplify a mathematical expression that represents this difference.

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Name: **Date:**

Use the following information to complete problems 7–9.

> A beagle can detect a biological trace element in the air in average concentrations of one part per ten million. Humans can detect similar substances in the air in average concentrations of one part per thousand.

7. Write fractions representing the sense of smell in beagles and humans.

8. Write common logarithms for each fraction determined in problem 7.

9. Compare the answers to problems 7 and 8, and describe a way of comparing the sense of smell of beagles and humans using powers of 10 and common logarithms.

Use the given information to complete problem 10.

10. The trumpet section of the school band has 6 trumpets that can produce a sound with an intensity level of 90 decibels (dB). Three more trumpets will be added to the trumpet section for the next school term. The band director says that this will make the band "50 percent louder." The math club president says the band will not be that loud. Who is correct, the band director or the math club president? Explain your answer using the sound-intensity function $D(I) = 10 \bullet \log\left(\frac{I}{I_0}\right)$, in which I_0 is the threshold of human hearing of 10^{-12} watt per square meter.