Algebra II End of Unit 4 Study Guide

____ 1. Which are true of $\log_{10} 31{,}500$? Select **all** that apply (no calculator).

a. $x < 4$

b. $x = 4$

c. $x > 4$

d. $x < 5$

e. $x = 5$

f. $x > 5$

____ 2. The equation $p(t) = 1 \cdot e^t$ represents a population of bacteria, in thousands, *t* days after it was first counted. Here is the graph.

Select **all** the true statements

a. $\ln(30)$ is the number of days until the population reaches 30,000.

b. The graph shows that 3 is a reasonable approximation for $\ln(20)$.

c. $\ln(t) = y$ is the logarithmic form of $y = e^t$.

d. The value of $p(t)$ is never equal to 0.

e. The graph shows that 10 is a reasonable approximation for $\ln(2.3)$.

____ 3. Technetium-99m is used as a radioactive tracer for certain medical tests. It has a half-life of 1 day. The function $T(d) = 100(2)^{-d}$ is the percent of Technetium-99m remaining d days after the test. Which expression represents the number of days until only 5% remains?

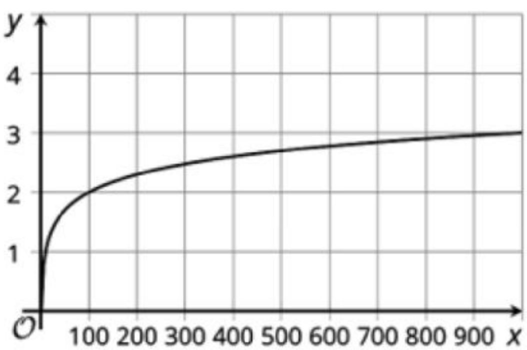
a. $\log_{20} 2$

b. $-\log_2 20$

c. $\log_2 \frac{1}{20}$

d. $-\log_2 \frac{1}{20}$

4. Here is a graph of $y = \log_{10} x$.



a. What does the point $(100, 2)$ represent?

b. What is the x-intercept of the graph?

c. When will the graph meet the line $y = 5$?

5. Solve each equation:

a. $7 \cdot 10^{n} = 700$

b. $\frac{1}{2} \cdot 10^{(y-3)} = 0.5$

c. $5 \cdot 2^{x} = \frac{5}{16}$

____ 6. Select **all** expressions equal to $\log_2 16$ (no calculator).

a. $\log_5 20$

b. $\log_5 625$

c. $\log_{10} 1000$

d. $\log_{10} 10000$

e. $\log_{16} \frac{1}{2}$

f. $\log_4 256$

7. The population of a town is growing exponentially and can be modeled by the equation $38 \cdot e^{0.061t}$. The population is measured in thousands, and time is measured in years since 1975.

a. What was the population of the town in 1975?

b. What was the annual growth rate?

c. To the nearest whole number, what was the population in 1995?

d. To the nearest whole number, what was the population in 1970?

8. The expression $1 \cdot e^{0.034t}$ models the balance, in thousands of dollars, where *t* represents time in years after the account was opened.

   a. What does the 0.034 represent in this context?

   b. Write an expression and solve it for the number of years after which there will be $15,000 in the account.

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Answer Section

1. C, D
2. A, B, D
3. D
4. a. Substitute *x* and *y*, $\log_{10} 100 = 2$

   b. *x*-intercept is where $y = 0$, so $0 = \log_{10} x$. Rewriting as an exponential, $10^0 = x$, so $x = 1$ (anything to power of zero is one).

   c. Where $5 = \log_{10} x$. Rewriting as an exponential $10^5 = x$ so $x = 100,000$
5. a. $n = 2$

   b. $y = 3$

   c. $x = -4$
6. B, D, F
7. a. 38,000

   b. $e^{0.061} = 1.06289 \approx 6.3\%$

   c. $38 \cdot e^{(0.061 \cdot 20)} = 128.713$ (thousands) = 128,713

   d. $38 \cdot e^{(0.061 \cdot -5)} = 28.011$ (thousands) = 28,011
8. a. The 3.4% **<u>continuous</u>** growth rate of the account.

   b. $\dfrac{\ln(15)}{0.034} \approx 79.6$ years.