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Find each of the following without using a calculator.

1. $\log_4 256 =$ ______
2. $\log_4 0.25 =$ ______
3. $\log_{27} 9 =$ ______

Solve each of the following equations, without using a calculator.

4. $5^{(3x + 2)} = 125$
5. $\log_2 x + \log_2 (x - 6) = 4$

6. $8^{(x + 3)} = 32^{(2x - 1)}$
7. $\log_3 (10x - 17) - \log_3 (x - 2) = \log_3 (x + 6)$

Let $w = \log_B 2$, $x = \log_B 3$, and $y = \log_B 5$. Express each of the following in terms of w, x, and/or y.

8. $\log_B 10 =$ ______
9. $\log_B 125 =$ ______

10. $\log_B 0.6 =$ ______
11. $\log_B (5B^2) =$ ______

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Find each of the following. Round your answers to two decimal places.

12. $\log_3 30 =$ ______

13. $\log_3 e^6 =$ ______

Express each of the following as the log of a single expression.

14. $3\log x + 2\log y - 5\log z =$ __________

15. $0.5(\log x - \log 2) =$ __________

Solve each of the following problems. (Show any equation you use to find your solution.)

16. \$8000 is invested at 4.5% per year compounded daily. What will the balance be after 20 years?

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17. \$10,000 is invested at 7% per year compounded continuously. What will be the balance after 20 years?

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Solve each of the following equations. Express your solutions rounded to two decimal places.

18. $e^{(2x + 1)} = 20$

19. $\log x + \log(3x - 1) = 1$

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Solve each of the following problems. Show all of your work neatly organized. (Round off to 3 significant digits, where appropriate.)

20. A certain city had a population of 400,000 in 1970 and 550,000 in 1990.
a. Express the population as a function of time using the model $P = Ce^{kt}$. Assume $t = 0$ corresponds to the year 1970.

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b. Use your model to estimate the population of the city in the year 2000.

21. A certain radioactive substance, having a current mass of 25.0 grams, has a half-life of 200 years.
a. Express the quantity of the substance as a function of time using the model $Q = Me^{kt}$.

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b. Use your model to approximate the mass remaining in 500 years.

Solve each of the following problems. Show all of your work neatly organized. (Round off to 3 significant digits, where appropriate.)

22. A computer that costs $2000 new has a depreciated value of $1200 after 4 years.
a. Express the depreciated value of the computer as a function of time using the model $V = Ce^{kt}$.

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b. Use your model to approximate the depreciated value of the computer after 7 years.

23. A particular strain of bacteria grows in a culture from a population of 250 bacteria to 600 bacteria in 3 hours.
a. Express the number of bacteria present in the culture as a function of time using the model $N = Ce^{kt}$.

b. Use your model to estimate the number of bacteria present after 4 hours.