Algebra 2   Name_____
Exponential and Logarithmic Word Problems Notes   Date_____ Period____

Find the inverse of each function.

1) $y = \left(\dfrac{2^x + 6}{-3}\right)^{\frac{1}{3}}$

2) $y = \log_5\left(-4x + 6\right) + 4$

3) $y = \left(\dfrac{e^x + 10}{2}\right)^{\frac{1}{5}}$

4) $y = \ln\left(4x - 10\right) - 6$

5) A substance decays 22% each day. After 7 days, there are 9 milligrams of the substance remaining. How many milligrams were there initially?

6) Sam opened a bank account with an interest rate of 4.8% that is compounded annually. He invested $3,890 in the account in 1999 but had to make a withdrawal from his account in 2007 in the amount of $2,300 with no penalty. How much money is in his account now, in 2016?

7) How much more money would Sam have now in his account, in 2016 if he hadn't needed to make the withdrawal?

8) In 1963, the number of cars in the U.S. was about 1.7 million. By 1988, it had increased to about 2.9 million. Write an exponential function in the form $y = ab^x$ that could be used to model the number of cars y in millions for 1963 to 1988. Write the equation in terms of x, the number of years since 1963. Round the value of b to the nearest thousandth.

9) Suppose the number of cars continued to grow at that rate. Estimate the number in 2005.

10) The number n of college graduates in thousands after t years can be modeled by $n = 46 \log_5 (t + 3)$. Let $t = 0$ represent 1985. How many college graduates were there in 2003?

11) How long until there are 123,000 college graduates? When will this occur?

12) When Angela was born, her grandparents deposited $5,000 into a college savings account paying 6% interest compounded continuously. Using the formula, $A = Pe^{rt}$, what is the balance after 15 years?

13) How long will it take the balance to reach at least $17,000

14) If her grandparents want her to have $15,000 after 17 years, how much would they need to invest?

15) What would the interest in the account need to be if after the initial deposit of $5,000, Angela needed the balance to be $24,000 after 18 years?

16) In 2003, the population of the state of New York was 10.78 million people. In 1990, it was 7.99 million. Using the population growth formula $y = ae^{kt}$, determine the value of k, New York's relative rate of growth.

17) When will New York's population reach 15 million people?

18) Nevada's population in 1990 was 14.2 million and can be modeled by $y = 14.2e^{0.0079t}$. Determine when New Yorks's population will surpass Nevada's.

Algebra 2

Name_____

Exponential and Logarithmic Word Problems Notes

Date_____ Period_____

Find the inverse of each function.

1) $y = \left(\dfrac{2^x + 6}{-3}\right)^{\frac{1}{3}}$

$y = \log_2\left(-3x^3 - 6\right)$

2) $y = \log_5\left(-4x + 6\right) + 4$

$y = \dfrac{5^{x-4} - 6}{-4}$

3) $y = \left(\dfrac{e^x + 10}{2}\right)^{\frac{1}{5}}$

$y = \ln\left(2x^5 - 10\right)$

4) $y = \ln\left(4x - 10\right) - 6$

$y = \dfrac{e^{x+6} + 10}{4}$

5) A substance decays 22% each day. After 7 days, there are 9 milligrams of the substance remaining. How many milligrams were there initially?

about 51.2 mg

6) Sam opened a bank account with an interest rate of 4.8% that is compounded annually. He invested $3,890 in the account in 1999 but had to make a withdrawal from his account in 2007 in the amount of $2,300 with no penalty. How much money is in his account now, in 2016?

$5124.26

7) How much more money would Sam have now in his account, in 2016 if he hadn't needed to make the withdrawal?

$3507.34

8) In 1963, the number of cars in the U.S. was about 1.7 million. By 1988, it had increased to about 2.9 million. Write an exponential function in the form $y = ab^x$ that could be used to model the number of cars y in millions for 1963 to 1988. Write the equation in terms of x, the number of years since 1963. Round the value of b to the nearest thousandth.

$y = 1.7 \cdot 1.022^x$

9) Suppose the number of cars continued to grow at that rate. Estimate the number in 2005.

4.24 million

10) The number n of college graduates in thousands after t years can be modeled by $n = 46 \log_5 (t + 3)$. Let $t = 0$ represent 1985. How many college graduates were there in 2003?

87,017

11) How long until there are 123,000 college graduates? When will this occur?

71 years , 2056

12) When Angela was born, her grandparents deposited $5,000 into a college savings account paying 6% interest compounded continuously. Using the formula, $A = Pe^{rt}$, what is the balance after 15 years?

$12,298.02

13) How long will it take the balance to reach at least $17,000

$t > 20.4$ so over 20 years

14) If her grandparents want her to have $15,000 after 17 years, how much would they need to invest?

$5,408.92

15) What would the interest in the account need to be if after the initial deposit of $5,000, Angela needed the balance to be $24,000 after 18 years?

8.71%

16) In 2003, the population of the state of New York was 10.78 million people. In 1990, it was 7.99 million. Using the population growth formula $y = ae^{kt}$, determine the value of k, New York's relative rate of growth.

$k = 0.02304$ or about 2.304%

17) When will New York's population reach 15 million people?

2018

18) Nevada's population in 1990 was 14.2 million and can be modeled by $y = 14.2e^{0.0079t}$. Determine when New Yorks's population will surpass Nevada's.

$t > 37.98$ so during 2028