Name: $\qquad$
Unit 2 - 3.2B - Domain of logs and Inverse Practice
Date: $\qquad$ Period: $\qquad$
Find the Domain of each function. Write your answers using interval notation.

1. $\log (3-x)$
2. $\log (2-7 x)$
3. $\ln \left(x^{2}-x-2\right)$
4. $\ln \left(x^{2}-4 x-12\right)$
5. $\log \left(\frac{x+1}{x-5}\right)$
6. $\log \left(x^{3}-2 x^{2}+x\right)$

Find the inverse of each function.
7. $f(x)=\log (x+2)-4$
8. $g(x)=-\ln (-x-2)+4$
9. $f(x)=\log _{3}(x-3)-5$
10. $g(x)=\log _{7}(-x)-1$
11. $y=e^{x+2}-1$
12. $h(x)=-7^{x}+2$
13. $f(x)=8^{x+7}-11$
14. $g(x)=4^{-x+2}-14$
15. Find the domain of $y=\ln \left(x^{2}-24\right)+$

1. Leave your answer in reduced radical form.

Name: $\qquad$
Unit 2 - 3.5 - Exponential Growth and Decay
Date: $\qquad$

## For $1-5$, use the following situation.

The exponential models describe the population of the indicated country, $A$, in millions, $t$ in years, after 2006.

$$
\begin{array}{cc}
\text { India: } A=1095.4 e^{0.014 t} & \text { Japan: } A=127.5 e^{0.001 t} \\
\text { Iraq: } A=26.8 e^{0.027 t} & \text { Russia: } A=142.9 e^{-0.004 t}
\end{array}
$$

1. What was the population of Japan in 2006 ?
2. What was the population of Iraq in 2006 ?
3. Which country has the greatest growth rate? By what percentage is the population of that country increasing each year?
4. Which country has a decreasing population? By what percentage is the population of that country decreasing each year?
5. When will India's population be 1238 Million?
6. The half-life of radium is 1690 years. If 10 grams are present now, how much will be present in 50 years?
7. The half-life of radioactive potassium is 1.3 billion years. If 10 grams are present now, how much will be present in 1,000 years? $1,000,000$ years?
8. A piece of charcoal is found to contain $30 \%$ of the carbon-14 it originally had. When did the tree from which the charcoal came die? Use 5,715 years as the half-life of carbon-14.
9. A radioactive substance has a half-life of 420 years. How much remains of a 2 ounce sample after 200 years?
10. An isotope of sodium has a half-life of 15 hours. How many hours will it take for $40 \%$ of a given amount to remain?

Use the following formula $t=\frac{\ln (2)}{k}$ that gives the time for a population with growth rate $k$ to double to solve the following. Express each answer to the nearest whole year.
11. The growth model $A=4.1 e^{0.01 t}$ describes New Zealand's population, $A$, in millions, $t$ in years after 2006.
a. What is New Zealand's growth rate?
b. How long will it take New Zealand to double its population?
c. How long will it take New Zealand to triple its population?
12. You open a savings account that pays $6.5 \%$ annual interest. After how many years will you have twice the amount you deposited? Assume continuous compounding.
13. How long will it take money to triple in an account that pays $8.1 \%$ in interest and is compounded continuously?
14. If you deposit $\$ 1,000.00$ into an account that pays $9 \%$ annual interest, compounded monthly, how long would you have to wait to have $\$ 5,000.00$ in your account?
15. How much money must be invested at $9 \%$ interest compounded continuously to yield $\$ 650.00$ after 2 years?
$\qquad$
$\qquad$ Period: $\qquad$

1. A bacteria culture has an initial count estimate of 4,000 . After 20 minutes, the count is 22,400 . Approximately how many minutes did it take for the culture to double?
2. The population of a colony of mosquitoes obeys the law of uninhibited growth. If there are 1,000 mosquitoes initially, and there are 1,800 after one day, how many mosquitoes are there after 3 days? How long will it take to reach 10,000 mosquitoes?
3. A culture of bacteria obeys the law of uninhibited growth. If there are 500 bacteria cells present initially, and there are 800 after 1 hour, how many will be present in the culture after 5 hours? How long until there are 20,000 bacteria?
4. The population of a southern city follows the exponential law. If there population doubled in size over an 18 month period, and the currently population is 10,000 , what will the population be 2 years from now?
5. The population of a Midwestern city follows the exponential law. If the population decreased from 900,000 to 800,000 from $1984-1986$, what is the population in 1988 assuming the exponential model is followed?
6. Suppose a certain radioactive substance has a half-life of 276 hours. How long will it take for only $30 \%$ of the substance to remain?
7. Kyle deposits $\$ 900.00$ into an account earning $5.6 \%$ annual interest with monthly compounding. In how many years will he have tripled his original deposit?
8. Julia has tripled her savings after 10 years. What is her fixed annual interest assuming continuous compounding?
9. Suppose that a colony of bacteria is growing exponentially. If 12 hours are required for the number of bacteria to grow from 4,000 to 6,000 , find the doubling time?
$\qquad$
$\qquad$ Period: $\qquad$
10. How much money must be invested at $8.7 \%$ interest compounded continuously to yield $\$ 4,555.00$ after 5 years?
11. How long must a certain amount of money be invested at $9 \%$ interest compounded monthly before it is doubled?
12. An exponential model for the population in Russia is given by the following. $A$ in million, $t$ in years after 2006. $A=142.9 e^{-0.004 t}$
a. What is the population in 2006
b. Is the population increasing or decreasing?
c. What is the population in 2014 ?
d. When will the population be 129 million according to this model?
13. A fossil is found to contain $32 \%$ of its original amount of carbon-14. How old is the fossil? Use 5,715 years as the half-life.
14. A certain radioactive substance decays to $28 \%$ of its original amount in 145 years. Find is half-life.
15. Liberty and Kailey were strolling through the park one day at $4: 12 \mathrm{pm}$ on a perfect 79 degrees spring day. Suddenly, they discovered a dead body. Liberty took out her handy dandy thermometer, and measured the temperature of the body as 97.7 degrees. One hour later, she measured the temperature and it was 96.2 degrees. At what time did the body die? Assume normal body temperature is 98.6 degrees. Use newton's Law of Cooling.
16. A thermometer reading 72 degrees F is placed in a refrigerator where the temperature is constant 38 degrees.
a. If the thermometer reads 60 degrees F after 2 minutes, what will it read after 7 minutes?
b. How long will it take before the thermometer reads 39 degrees F ?
17. A pizza is baked at 450 degrees $F$ is removed from the oven at $5: 00 \mathrm{pm}$ into a room that is constant 70 degrees F . After 5 minutes, the pizza is 300 degrees F . At what time can you begin eating the pizza if you want the temperature to be 135 degrees F ?
