Integrated Math 3 Name KEY

12.1-12.2 Exponential Functions Date ______________ Period ______

Review Worksheet

Construct an exponential function from each Geometric Sequence.

1. $a_n = 3(2)^{n-1}$

$3 \cdot 2^n \cdot 2^{-1}$

$3 \cdot 2^n \cdot \frac{1}{2}$

$a_n = \frac{3}{2} \cdot 2^n$

2. $a_n = 5(\frac{1}{2})^{n-1}$

$5 \cdot \frac{1}{2}^n \cdot \frac{1}{2}^{-1}$

$5 \cdot \frac{1}{2}^n \cdot 2$

$a_n = 10 \cdot \frac{1}{2}^n$

3. $a_n = 2(0.6)^{n-1}$

$= 2 \cdot 0.6^n \cdot 0.6^{-1}$

$2 \cdot 0.6^n \cdot \frac{5}{3}$

$a_n = \frac{10}{3} \cdot 0.6^n$

4. $a_n = 1(10)^{n-1}$

$10^n \cdot 10^{-1}$

$a_n = \frac{1}{10} \cdot 10^n$

Complete the following exercises involving Half-Life.

5. If 10 mg of iodine 131 is given to a patient, how much is left after 24 days? The half-life of iodine-131 is 8 days.

$10 \cdot (\frac{1}{2})^{\frac{24}{8}}$ $\quad 10 \cdot \frac{1}{2}^3$ $\quad 10 \cdot \frac{1}{8}$ $\quad \frac{10}{8} = \frac{5}{4} = 1.25$ mg

6. Barium-122 has a half-life of 2 minutes. A fresh sample weighing 80 g was obtained. If it takes 10 minutes to set up an experiment using barium-122, how much barium-122 will be left when the experiment begins?

$80 \cdot (\frac{1}{2})^{\frac{10}{2}}$ $\quad 80 \cdot \frac{1}{2}^5$ $\quad 80 \cdot \frac{1}{32}$ $\quad 2.5$ g

7. Mercury -197 is used for kidney scans and has a half-life of 3 days. If the amount of mercury-197 needed for a study is 1.0 gram and the time allowed for shipment is 15 days, how much mercury-197 will need to be ordered?

$1 = A \cdot (\frac{1}{2})^{\frac{15}{3}}$ $\quad 1 = A \cdot \frac{1}{2}^5$ $\quad 32 \cdot 1 = A \cdot \frac{1}{32} \cdot 32$ $\quad 32 = A$

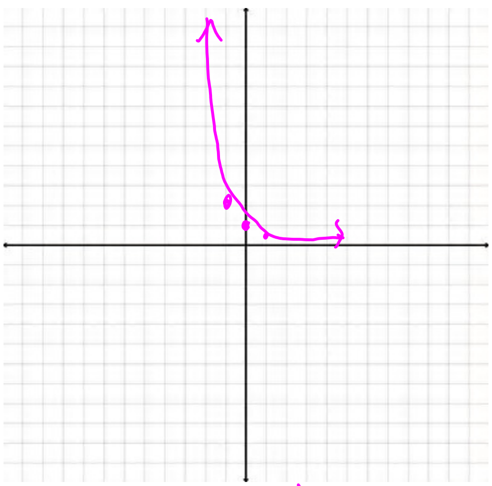
32 g must be ordered

Graph the following exponential functions and complete the provided 3 point table.

$\frac{1}{2}^x$

8. $f(x) = 0.5^x$

x	$f(x)$
−1	2
0	1
1	0.5



Increasing or Decreasing: Decreasing

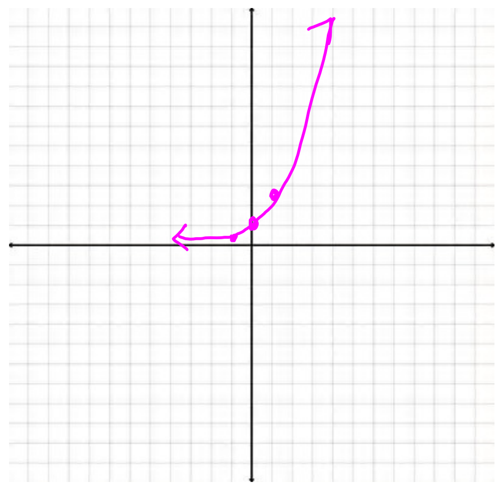
Over What Interval? $(-\infty, \infty)$

Domain: $(-\infty, \infty)$

Range: $(0, \infty)$

9. $f(x) = e^x$

e^x



x	$f(x)$
−1	
0	1
1	2.71

Increasing or Decreasing: Increasing

Over What Interval? $(-\infty, \infty)$

Domain: $(-\infty, \infty)$

Range: $(0, \infty)$

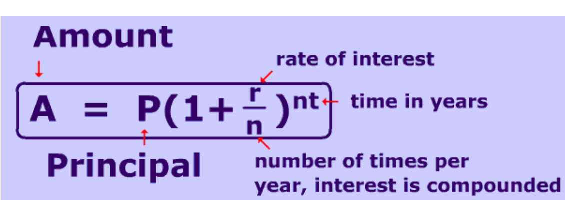
10. Which function above represented Exponential Growth? $f(x) = e^x$ Decay? $f(x) = 0.5^x$

11. Write a function that would demonstrate Exponential Growth (Different from Above!). $b > 1$

12. Write a function that would demonstrate Exponential Decay (Different from Above!). $0 < b < 1$

Compound Interest

13. If you have a bank account whose principal = $1000, and your bank compounds the interest twice a year at an interest rate of 5%, how much money do you have in your account at the year's end?



$A = 1000\left(1 + \frac{.05}{2}\right)^{2\cdot 1}$

$1000(1 + .025)^2$

$1,050.63

4

14. If you start a bank account with $10,000 and your bank compounds the interest quarterly at an interest rate of 8%, how much money do you have at the year's end ?

$A = 10000\left(1 + \frac{.08}{4}\right)^{4\cdot 1}$

$10000(1.02)^4$

$10,824.32

15. You win the lottery and get $1,000,000. You decide that you want to invest all of the money in a savings account. However, your bank has two different plans. In 5 years from now, which plan will provide you with more money??

Plan 1

The bank gives you a 6% interest rate and compounds the interest each month.

Plan 2

The bank gives you a 12% interest rate and compounds the interest every 2 months.

Plan 1

$1000000\left(1 + \frac{.06}{12}\right)^{12\cdot 5}$

$1000000(1.005)^{60}$

$1,348,850.15

Plan 2

$1000000\left(1 + \frac{.12}{6}\right)^{6\cdot 5}$

$1000000(1.02)^{30}$

$1,811,361.58

Choose Plan 2!

Population Growth and Decay

16. In 2005, there were 85 rabbits in Central Park. The population is continuously growing at a rate of 12% each year. How many rabbits were in Central Park in 2015?

The formula for population growth is $N(t) = N_0e^{rt}$. Complete the table to identify the contextual meaning of each quantity.

Quantity	Contextual Meaning
N_0	initial amount of population
r	rate of growth
t	time
$N(t)$	population after t years

$85e^{.12\cdot 10}$

$85e^{1.2}$

≈ 282 Rabbits

17. In 2015, the population in Lockport was 56,000. It is projected that the population will grow continuously at a rate of 1.9% each year. What is the anticipated population for Lockport in the year 2020?

$56000e^{.019 \cdot 5}$

$56000e^{.095}$

$\approx 61,581$

18. Using your population model from the above example, what was the population of Lockport in 1995? (Assume the population grew at the same 1.9% rate from 1995 to 2015).

$56000e^{.019 \cdot -20}$

$56000e^{-.38}$

$\approx 38,296$