

Name: \_\_\_\_\_

623 Review for Bigger Quiz 4.1-5

1. Simplify each expression.

a.)  $\sqrt{64x^6}$

$8x^3$

b.)  $(27z^5)^{\frac{1}{3}}$

$3z^{\frac{5}{3}}$

c.)  $\sqrt[4]{16(x^3)^6}$

$2x^{\frac{9}{2}}$

d.)  $\left(\frac{64}{81}\right)^{-\frac{1}{4}}$

$\left(\frac{81}{64}\right)^{\frac{1}{4}} = \frac{3}{64^{\frac{1}{4}}}$

2. Solve each equation.

a.)  $6^n = 99$

$n \log 6 = \log 99$   
 $n \approx 2.56$

b.)  $18^{6x} = 26$

$\frac{6x \log 18}{6 \log 18} = \frac{\log 26}{6 \log 18} = .18$

c.)  $\left(x^{\frac{2}{3}} = 27\right)^{\frac{3}{12}}$

$x \approx 140.3$

d.)  $\log_5 125 = x$

$5^x = 125$   
 $x = 3$

3. Convert from exponential to logarithmic form.

a.)  $6^2 = 36$

$\log_6 36 = 2$

b.)  $3^3 = 27$

$\log_3 27 = 3$

4. Convert from logarithmic to exponential form. Solve for x.

a.)  $\log_2 x = 5$

$2^5 = x$   
 $x = 32$

b.)  $\log_4 12 = x$

$4^x = 12$   
 $x \log_4 4 = \log_4 12$

As of July 2009, the population of Nigeria was 149,229,090 and was growing at a rate of 2.5% per year.

- a.) Write an equation that describes the population.

$$y = 149,229,090 (1.025)^{(x-2009)}$$

- b.) Assuming that its growth rate remains the same, what will be Nigeria's population in July 2040?  $x=31$

$$y = 149,229,090 (1.025)^{31}$$

$$= 320,843,553 \text{ people}$$

- c.) In what year will Nigeria's population pass 200,000,000?

$$200,000,000 = 149,229,090 (1.025)^x$$

$$\frac{200,000,000}{149,229,090} = 1.025^x$$

$$\log 1.34 = x \log 1.025$$

$$x \approx 11.9 \text{ years on } 2021$$

- 6.) Acetaminophen, the active ingredient in Tylenol, decreases in your bloodstream by 20.6% each hour. You take a dosage that contains 5 milligrams of acetaminophen.

- a.) Write an equation that describes the amount of Tylenol in your system after x hours.

$$y = 5(1 - .206)^x$$

$x \rightarrow \text{hours}$

$$y = 5(.794)^x$$

- a.) How much will you have in your bloodstream 4 hours after taking your 5-milligram dosage?

$$y = 5(.794)^4$$

$$\approx 2 \text{ mg.}$$

7. The Whitetail Wildlife Refuge is home to a population of 30 bright-eyed and active deer. From observation of the deer over time, it has been determined that the deer population is growing each year by about 25%.

- a.) Write an equation modeling the expected population of deer for a given year x.

$$y = 30(1.25)^x$$

- b.) Use your equation to determine the deer population 10 years from now.

$$y = 30(1.25)^{10}$$

$$\approx 279 \text{ deer}$$

- a. What is the growth rate of the population given in the table.

growth factor  $\times 3$   
growth rate 200%

0	3
1	9
2	27
3	81
4	243
5	729

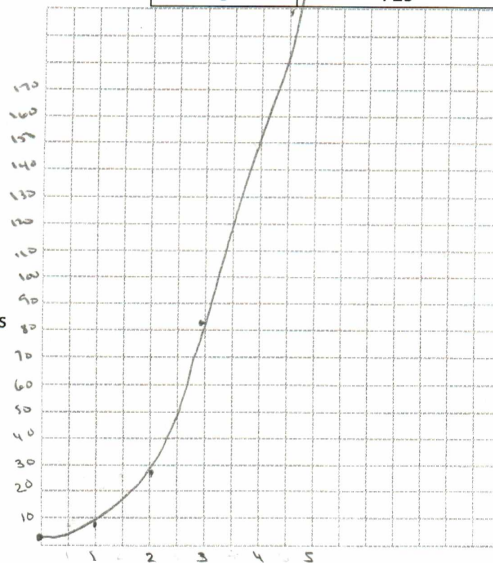
- b. Create a scatterplot of the data in the table.

Describe in writing what your graph looks like. Use mathematical vocabulary. Include a description of exponential growth and exponential decay graphs.

exponential growth  
y-intercept 3  
domain  $x \geq 0$   
range  $y \geq 3$

Write an exponential equation that describes the data.

$$y = 3(3)^x$$



Write an equation of the exponential graph pictured to the right. The points indicated occur at the intersection of the grid lines (these are good points to use when trying to create your equation).

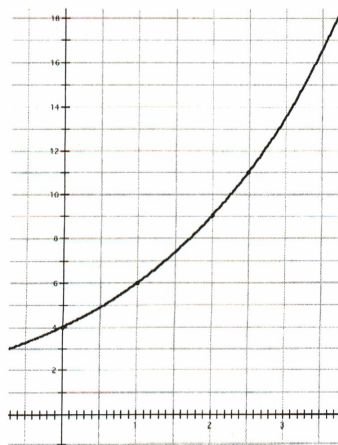
(0, 4) (2, 9)

$$y = 4b^x$$

$$9 = 4 \cdot b^2$$

$$\frac{9}{4} = b^2$$

$$\underline{3} = b$$



5  
3

The value of most cars (except antique cars) depreciates (decreases) over time. A general rule of thumb used by car dealers is that the value of a car decreases 30% each year. Suppose you just purchased a car costing \$22,500. How much will it be worth in 5 years?

$$y = 22500(1-0.3)^5$$

$$= \underline{\underline{83781}}$$

Gary just deposited money into a bank account. The amount of money he will have in his account is given by the equation  $y = 9500(1.025)^x$  where  $x$  represents the number of years.

- a. How much interest is Gary earning each year on his account?

$$2.5\%$$

- b. How much money did Gary initially invest in the account?

$$\underline{\underline{\$9500}}$$

- c. How much money will Gary have after 5 years?

$$\underline{\underline{\$10,748.37}}$$

- d. How long will it take for Gary's initial investment to double in size? (Assume the account only earns interest at the end of the year.)

$$2 = 1.025^x$$

$$\log 2 = x \log 1.025$$

$$x = \frac{\log 2}{\log 1.025} \approx \underline{\underline{28 \text{ years}}}$$

A club's membership has been growing exponentially since the club was founded. The club had 12 members 3 months after it was founded, and 36 members 6 months after it was founded. Find an exponential function that models the club's membership. How many members were part of the club at its inception?

$$(3, 12) \quad (6, 36)$$

$$12 = a \cdot b^3$$

$$36 = a \cdot b^6$$

$$3 = b^3 \quad b = \underline{\underline{1.44}}$$

$$x \rightarrow \text{months} \quad y \rightarrow \text{members}$$

$$y = a \cdot 1.44^x$$

$$12 = a(1.44)^3$$

$$a = \underline{\underline{4.01}}$$

$$\underline{\underline{y = 4.01(1.44)^x}}$$

3. A town's population has been declining exponentially since the local factory closed. 2 years after the factory closing, the population was 9,600 people. 6 years after the factory closing, the population was 6,144 people. Find an exponential function that models the town's population. Determine how many people were living in the town when the factory closed.

$$x \rightarrow \text{year} \quad y \rightarrow \text{people}$$

$$(2, 9600) \quad (6, 6144)$$

$$6144 = a \cdot b^6$$

$$9600 = a \cdot b^2$$

$$y = 12034(.874)^x$$