

Name \_\_\_\_\_ Exponentials Mid-Unit Summary

A. Properties of Exponents

$a^m \cdot a^n = a^{m+n}$  if you multiply the bases, add the exponents

$(a^m)^n = a^{mn}$  if you raise a power to another exponent, multiply the exponents

$\frac{a^m}{a^n} = a^{m-n}$  if you divide the bases, subtract the exponents

$a^0 = 1$        $a^{-n} = \frac{1}{a^n}$  a negative exponent is the symbol to take the reciprocal

1.  $\frac{18w^5x^3}{6w^2x}$

2.  $\frac{20ab^8c^2}{12a^3b^2c^2}$

3.  $(5x^4y^{-3}z^8)^0$

4.  $5x^3(2x^7)$

5.  $(4x^{-3}y^5z)^3$

6.  $(2x^4y^3)^2(3xy^5)^3$

7.  $(5x^8)^3(2x^5)^2$

8. examine the solution #7. Identify the following:

Coefficient \_\_\_\_\_ base \_\_\_\_\_ exponent \_\_\_\_\_

Write each of the following with a single power:

9.  $100x^2y^2$

10.  $27x^6y^3$

11.  $125a^3b^9$

12.  $36x^4y^2$

Solve for x: (hint - identify the base that is larger and rewrite it as a power.)

13.  $2^{4x} = 32^2$

14.  $3^{8x} = 81^{12}$

15.  $2^x = 64^8$

16. Evaluate  $y = 4^x$  for the domain  $\{-2, -1, 0, 1, 2, 3\}$  No decimals!

17. Compound interest: you can use  $y = ab^x$  OR  $B = P(1 + r)^x$

a and P = starting amount

b or r = interest rate per period.  $\frac{\text{\%}}{\text{number of times per year compounded}}$

x = number of times interest is compounded (number of years passed \* number of times per year compounded)

A. Invest \$500 at 3% annual for 12 years

B. invest \$500 at 3% semiannual for 12 years

C. invest \$500 at 3% quarterly for 12 years

D. invest \$500 at 3% monthly for 12 years

18. Algebra club is growing exponentially at a rate of 5% each week. Algebra Club started its very first week ever with 6 students. How many will there be in 20 weeks?

19. What would be a reasonable domain and range for #18?

20. Eppler's centipede population is doubling every 5 months. Right now there are 3 centipedes. How many will there be in 60 months?

21. The half life of Byron-19 is 3 years. If you have 100 mg of Byron-19 right now:

A. what is an equation that models this situation? \_\_\_\_\_

B. How much Byron-19 will there be 12 years? \_\_\_\_\_

C. How much Byron-19 will there be in 36 years? \_\_\_\_\_

D. How much Byron-19 was there 6 years ago? \_\_\_\_\_

Exponential growth

$$Y = ab^x$$

$a$  = initial/starting amount

$b$  = growth factor,  $b > 1$

Exponential Growth

$$y = ab^x$$

$a$  (0,  $a$ )

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Exponential decay

$$Y = ab^x$$

$a$  = initial/starting amount

$b$  = decay factor,  $0 < b < 1$

Exponential Decay

$$y = ab^x$$

$a$  (0,  $a$ )

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For each of the following:

A. is this exponential growth or decay?

B. identify the rate of growth or decay

C. identify the y-intercept

22.  $y = 4(0.3)^x$

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

24.  $y = 5(2)^x$

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

23.  $Y = 0.5(1.25)^x$

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

25.  $Y = 6(0.5)^x$

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

26.

x	-3	-2	-1	0	1	2	3
y	.48828	.78125	1.25	2	3.2	5.12	8.192

A. \_\_\_\_\_ B. \_\_\_\_\_ (hint  $\frac{y_2}{y_1}$ ) C. \_\_\_\_\_

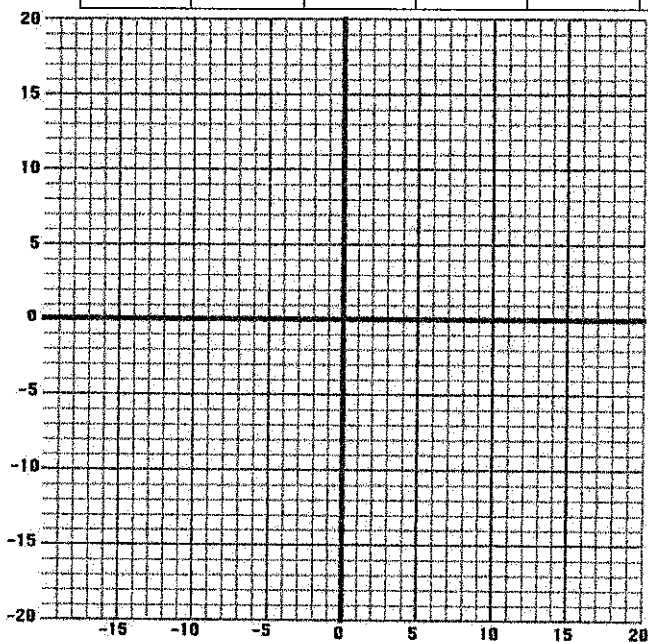
27.

x	-3	-2	-1	0	1	2	3
y	281.125	112.5	45	18	7.2	2.88	1.152

A. \_\_\_\_\_ B. \_\_\_\_\_ C. \_\_\_\_\_

28. Make a table of values and graph  $y = 8(0.7)^x$  and  $y = 4(1.6)^x$

<b>x</b>	<b>-2</b>	<b>-1</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>
$Y = 8(0.7)^x$						
$Y = 4(1.6)^x$						



	$y = 8(0.7)^x$	$y = 4(1.6)^x$
Is this growth or decay?		
What is the rate of growth or decay? (%)		
What is the y-intercept?		
What is the x-intercept?		
What is the asymptote?		
What is the domain?		
What is the range?		

Where do the graphs intersect? \_\_\_\_\_

29.  $f(x)$  is an exponential function, and  $g(x)$  is a linear function. What is the smallest integer value of  $x$  where  $f(x) > g(x)$

$x$	0	1	2	3
$f(x)$	6	9	13.5	20.25

$x$	0	1	2	3
$g(x)$	12	17	22	27

$f(x)$  is an exponential function, and  $g(x)$  is a linear function. What is the smallest integer value of  $x$  where  $f(x) > g(x)$

$x$	0	1	2	3
$f(x)$	$\frac{3}{7}$	$\frac{6}{7}$	$1\frac{5}{7}$	$3\frac{3}{7}$

$x$	0	1	2	3
$g(x)$	1	3	5	7