Name Key Algebra Exponential TEST REVIEW

1. D

The equation for the table on the left is $y = x + 25$. The equation for the table on the right is $y = 2^x$.

$y = x + 25$

x	y
0	25
1	26
2	27
3	28
4	29

x	y
0	1
1	2
2	4
3	8
4	16

x	y
5	30
6	31
7	32
8	33

x	y
5	32
6	64
7	128
8	256

What is the first whole number value of x where the y-value in the table on the right will surpass the y-value in the table on the left?

A. $x = 3$
B. $x = 4$
C. $x = 5$
D. $x = 6$

2. Evaluate $y = -2(4)^x$ for $x = -2$ and $x = 3$. No decimals!

$-2(4)^{-2} = -2\left(\frac{1}{4^2}\right) = -2 \cdot \frac{1}{16} = \frac{-2}{16} = \boxed{-\frac{1}{8}}$

$-2(4)^3 = -2(64) = \boxed{-128}$

3. Shawn buys a motorcycle. 5 years later he decides to sell it. He uses the following equation to determine his selling price:

$Y = 4500(.83)^5$. Describe what each value in the equation represents:

4500 initial price of motorcycle

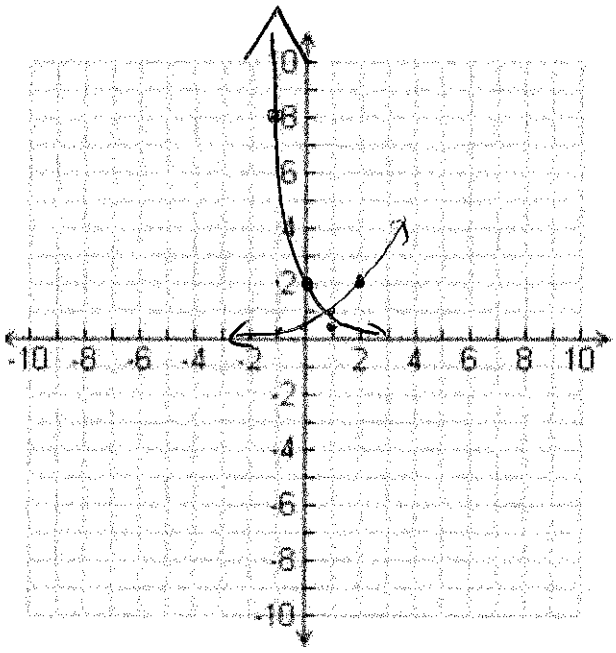
5 number of years

What is the decay factor? .83

What is the rate of depreciation? 17%

4. Make a table of values and graph $f(x) = 2(\frac{1}{4})^x$ and $h(x) = 0.5 \cdot 2^x$ Where do they intersect? (estimate, then use a graphing calculator for the exact value)

X	-2	-1	0	1	2
F(x)	$2(1/4)^{-2}$ $2 \cdot 16 = 32$	$2(1/4)^{-1}$ $2 \cdot 4 = 8$	$2(1/4)^0$ $= 2 \cdot 1 = 2$	$2(1/4)^1$ $= 1/2$	$2(1/4)^2$ $2 \cdot 1/16 = 1/8$
H(x)	$.5(2)^{-2}$ $1/2 \cdot 1/4 = 1/8$	$.5(2)^{-1}$ $1/2 \cdot 1/2 = 1/4$	$.5(2)^0$ $.5(1) = .5$	$.5(2)^1$ $= 1$	$.5(2)^2 = 2$



(.667, .794)

5. You have $300 in birthday money to put into a savings account. You want to use the money in 4 years. Which bank is the best option?

Meerhaeghe Money Maker: 4% compounded annually $P = 300$ $R = 4\%/1 = 4\% = .04$ $X = 4 \cdot 1 = 4$ $300(1.04)^4 = \$350.96$
Utica bank and trust: 5% compounded biannually $P = 300$ $R = 5\%/2 = 2.5\% = .025$ $X = 4 \cdot 2 = 8$ $300(1.025)^8 = \$365.52$
Chieftain Credit Union: 5% compounded quarterly $P = 300$ $R = 5\%/4 = 1.25\% = .0125$ $X = 4 \cdot 4 = 16$ $300(1.0125)^{16} = \$365.97$
Bank of Byron: 4.8% compounded monthly $P = 300$ $R = \frac{4.8\%}{12} = .4\% = .004$ $X = 12 \cdot 4 = 48$

$300(1.004)^{48} = \$363.36$

8. Solve for x:

A. $5^6 = 25^x$

$5^6 = (5^2)^x$

$6 = 2x$

$x = 3$

B. $3^{2x} = 9^4$

$3^{2x} = (3^2)^4$

$2x = 8$

$x = 4$

C. $4^x = 2^6$

$(2^2)^x = 2^6$

$2x = 6$

$x = 3$

D. $2^x = 16$

$2^x = 2^4$

$x = 4$

9. Solve for x: (no decimals!)

A. $3^{5x-2} = 27^{4x+3}$

$3^{5x-2} = (3^3)^{4x+3}$

$5x - 2 = 3(4x + 3)$

$5x - 2 = 12x + 9$

$-12x \quad -12x$

$-7x - 2 = 9$

$+2 \quad +2$

$-7x = 11$

$x = -11/7$

B. $2^{6x} = 32^{5x-1}$

$2^{6x} = (2^5)^{5x-1}$

$6x = 5(5x - 1)$

$6x = 25x - 5$

$-25x \quad -25x$

$-19x = -5$

$-19x = -5$

$\overline{-19} \quad \overline{-19}$

$x = 5/19$

10. Label each situation as exponential growth, exponential decay, or linear:

A. $y = 7(0.1)^x$ decay

B. $y = 7x + 1$ linear

C. $y = 0.1(7)^x$ growth

D. Increase the number of sit ups done each day by 5 linear

E. Increase the number of miles run each week by 10% growth.

F.

X	-2	-1	0	1	2
Y	.125	.25	.5	1	2

growth

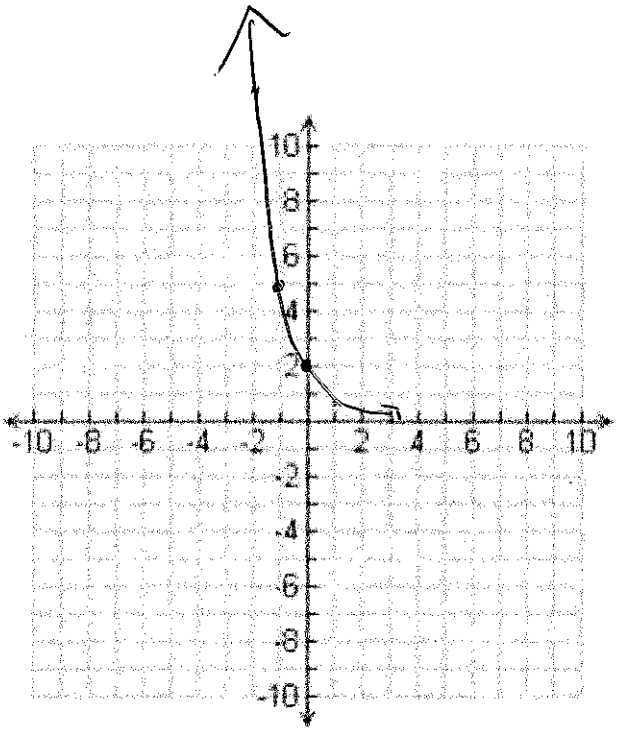
G.

X	-2	-1	0	1	2
Y	7.8	6.25	5	4	3.2

decay

6. graph $y = 2(0.4)^x$

x	-2	-1	0	1	2
y	12.5	5	2	.8	.32



What is the domain? $\mathbb{R}$

What is the range? $0 < y < \infty$

What is the asymptote? x-axis

Growth or decay? decay ($b = .4$)

For the following problems, consider the fact that your purchases were made the exact day that the item came out.

7. A. You build a new home for $125,000. It increases in value each year by approximately 2%. You use the equation $y = 125000(1.02)^x$ to keep track of the value of your home.

What is the domain of the situation? $0 \leq x < \infty$ $[0, \infty)$

What is the range of the situation? $125000 \leq y < \infty$ $[125000, \infty)$

B. You buy the X Box 1 for your brother. It cost $300. It loses around 7% of its value each year. You use the function $y = 300(.93)^x$ to keep track of its value.

What is the domain of the situation? $0 \leq x < \infty$ $[0, \infty)$

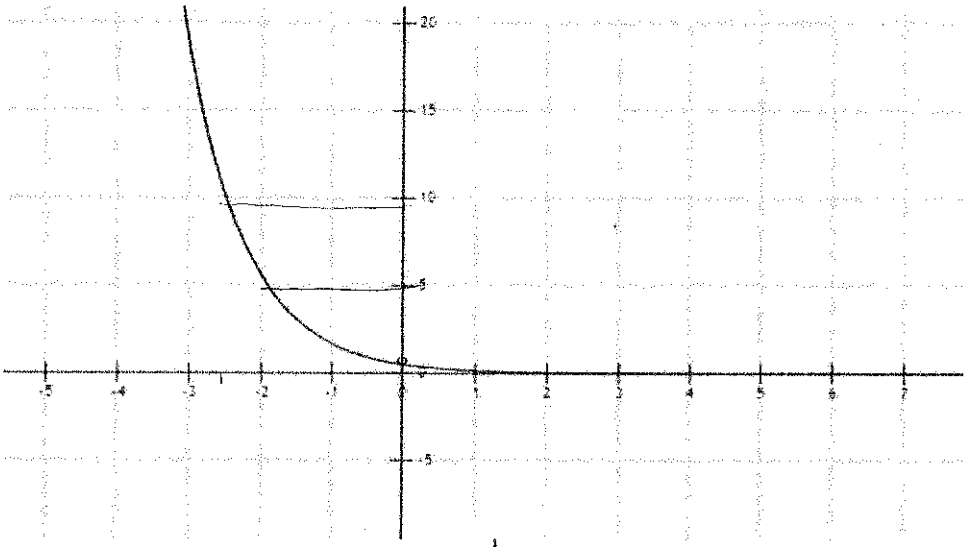
What is the range of the situation? $0 < y \leq 300$ $(0, 300]$

C. Consider the function $y = 2(3)^x$. There are no constraints on the graph.

What is the domain of the graph? $\mathbb{R}$

What is the range of the graph? $0 < y < \infty$

13.



y-intercept ~1 x-intercept none! growth or decay? decay

y = 5, x = −2 y = 10, x = −2.5

14. A certain kind of bacteria in a lab culture triples in number every 30 minutes. Suppose a culture started with 21 bacteria cells.

A. Write an equation: $y = 21(3)^{x/30}$

B. How many bacteria will there be in 2 hours? $21(3)^4$ (170) 2h = 120 min

C. How many bacteria were there 1 hour ago? $21(3)^{-2} = 2.3$ 1h = 60min ~2

15. The half-life of mystery substance 123 is 2 hours. You have 50 mg of mystery substance 123.

A. Write an equation: $y = 50\left(\frac{1}{2}\right)^{x/2}$

B. How many mg of mystery substance 123 is there in 6 hours? $50\left(\frac{1}{2}\right)^3 = 6.25$

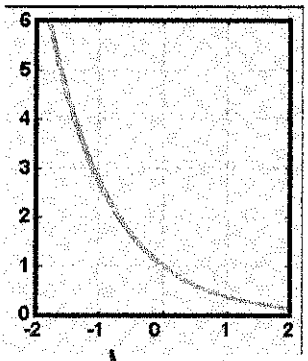
C. How many mg of mystery substance 123 is there in 15 hours? $50\left(\frac{1}{2}\right)^{7.5} = .28$

H.

X	-2	-1	0	1	2
Y	2.7	2.95	3.2	3.45	3.7

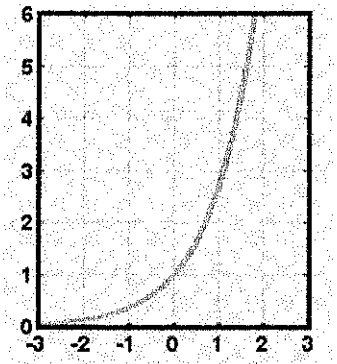
linear

I.



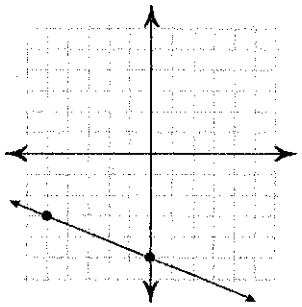
decay

J.



growth

K.



linear

11. Evaluate $f(x) = 4^x$ for the domain $\{-3, -2, -1, 0, 1, 2, 3\}$ No decimals!

$4^{-3} = \frac{1}{4^3} = \frac{1}{64}$

$4^{-2} = \frac{1}{16}$

$4^{-1} = \frac{1}{4}$

$4^0 = 1$

$4^1 = 4$

$4^2 = 16$

$4^3 = 64$

$\left\{\frac{1}{64}, \frac{1}{16}, \frac{1}{4}, 1, 4, 16, 64\right\}$

12. g(x) is linear and h(x) is exponential. Write a rule for each function.

g(x) = $1.5x + 9$

h(x) = $3(1.5)^x$

x	0	1	2	3	4	5	6
g(x)	9	10.5	12	13.5	15	16.5	18
h(x)	3	4.5	6.75	10.125	15.1875	22.78125	34.171885

+1.5

$\frac{4.5}{3} = 1.5$

23. rewrite with a single exponent:

A. $4x^2y^6z^8$

$2^2x^2(y^3)^2(z^4)^2$

$= (2xy^3z^4)^2$

B. $125x^6y^{15}z^3$

$5^3(x^2)^3(y^5)^3z^3$

$(5x^2y^5z)^3$

24. identify the coefficient, base, and exponent:

A. $50(2)^x$ B. $9x^3$ C. $-2(0.5)^4$

coeff	50	9	-2
base	2	x	.5
exp	x	3	4

25. $(5x^4)^2(2x^5)^3$

$25x^8(8x^{15})$

$200x^{23}$

26. $(m^x)^y$

$m^{x \cdot y}$

27. $m^x(m^y)$

m^{x+y}

28. $\frac{m^x}{m^y}$

m^{x-y}

16. A town has 200 people and it is growing by 24% each year.

A. write an equation: $y = 200(1.24)^x$

B. How many people will there be in 6 years? 727

C. How many people will there be in 15 years? 5039

D. How many people were there 3 years ago? 105

17. A town has 500 people but is losing 5% of its population each year.

A. write an equation: $y = 500(.95)^x$

B. How many people will there be in 6 years? 368

C. How many people will there be in 15 years? 232

D. How many people were there 3 years ago? 583

18. $y = 40(1.09)^x$

Is this growth or decay? Growth

What is the growth/decay factor? 1.09

What is the percent of increase or decrease? 9%

19. $y = 20(0.77)^x$

Is this growth or decay? decay

What is the growth/decay factor? .77

What is the percent of increase or decrease? 23%

20. $(3x)^0$

1

21. $\frac{9x^4y}{12xy^2}$

$\frac{3x^3}{4y}$

22. $(5a^4bc^6d^{-5})^2$

$\frac{25a^8b^2c^{12}}{d^{10}}$

29. You get to choose between two allowance plans, but you may change the plan at any time.

Plan #1: $6 each week

Plan #2: $0.25 for the first week, and it will double each additional week.

You will not be spending any of the money! $.25(2)^{x-1}$

A. How much will you receive at the end of the 5th week under
Plan #1 $60 Plan #2 $4

B. How much total will you have received at the end of the 5th week under
Plan #1 $30 Plan #2 $7.75

C. When should you switch plans? week 8 $63.75 w/plan #2 v. only $48 with plan #1 (total)

week	1	2	3	4	5	6	7	8
	.25	.50	1	2	4	8	16	32
total	.25	.75	1.75	3.75	7.75	15.75	31.75	63.75

plan 1 total 6 12 18 24 30 36 42 48

30. graph $f(x) = -.8(3)^x$

x	-2	-1	0	1	2
y	-.09	-.3	-.8	-2.4	-7.2

What is the domain? $\mathbb{R}$

What is the range? _____

What is the asymptote? x-axis

Growth or decay? growth