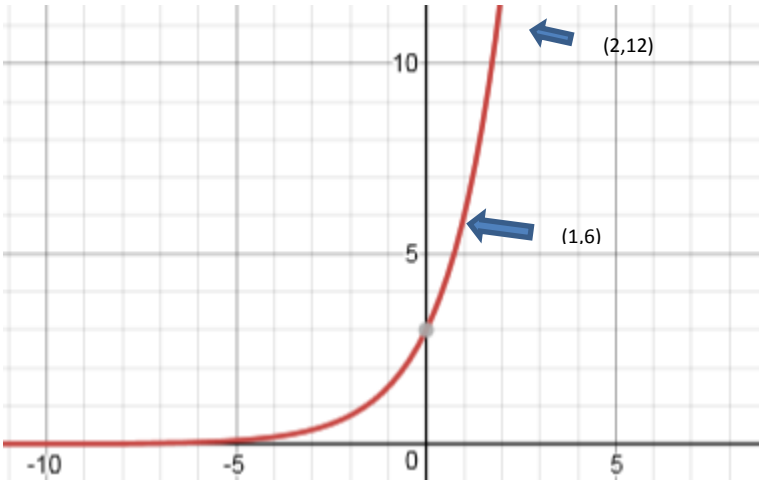
Advanced Algebra

Unit 3: Exponential, Log , and Power Functions

Learning Target: I can write the equation of a curve in the form $y = a*b^x$

The following is an example of how to write the equation of a curve in the form $y = a*b^x$



Method #1: To write this equation, we need to find the ratio b and the U_0 value which is in this case a. From our Unit 1 we solved this problem by making a table and finding the common multiplier. This can be done by the following:

Term	**0**	**1**	**2**		
Value		**6**	**12**		

b

So $6*b^1 = 12$ In this case all we need to do is divide by 6 and we find out that b is 2. You could then work backwards to find U_0. This is making a connection to Unit 1.

by the following:

Term	**0**	**1**	**2**		
Value	**3**	**6**	**12**		

2 2

So our final equation is $y = U_0*b^x$ or in this case it is $y = 3*2^x$

Check: You can now enter your equation into your GDC (Graphic Display Calculator) and verify.

Method #2: Step 1: Pick 2 points on the graph. In this case I will pick (1,6) and (2,12)

Step 2: Substitute the given points into the equation $y= a*b^x$

Using the point (1,6) I now have	Using the point (2,12) I now have
$6=ab^1$	$12=ab^2$

Step 3: I have 2 equations that are representing the same curve. I can divide the two equations to find the missing geometric ratio "b"

$\frac{12=ab^2}{6=ab^1}$ Now we can simplify. Notice that the common factor of a will reduce to 1

$2=b^1$

Step 4: Now just pick 1 of your ordered pairs and the common ratio "b" and substitute those into the equation $y=a*b^x$ and solve for "a" so you can write your final equation.

Point (1,6) b value is 2 ⇒ $6=a(2)^1$ ⇒ This gives us an a value of 3. So the final equation is given by

$Y=3*2^x$

Check: You can now enter your equation into your GDC (Graphic Display Calculator) and verify.

Method #3 More in depth showing algebraic substitution:

I know that $6=a*b^1$ and I know that $12=ab^2$ However we know that $12=ab^2$ can be written like the following: $12=(ab^1)b$ ⇒ we know that $ab^1 = 6$ so substitute that in for where you see the ab^1 and we now get $12=6b$ and so $b=2$

We now have $y=a*2^x$ and you now substitute an ordered pair in for x and y and solve for a.

Ordered pair (2,12) and b =2 so we have $12=a*2^2$ ⇒ $12=4a$ ⇒ $a=3$

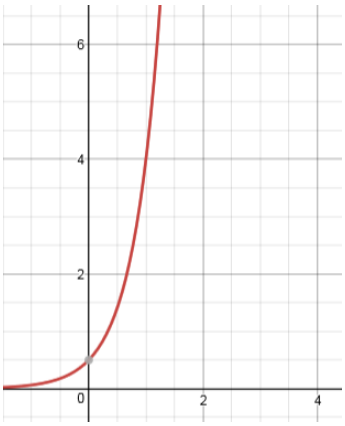
So the final equation is $y=3*2^x$

You now have 3 different ways to show your work to write the equation of a curve in the form $y = a*b^x$

Example #2:

Learning Target: I can write the equation of a curve in the form $y = a*b^x$

The following is an example of how to write the equation of a curve in the form $y = a*b^x$



(6,131072)

The graph is just a visual. The ordered pairs that are given are correct.

(4,2048

Method #1: To write this equation, we need to find the ratio b and the U_0 value which is in this case a. From our Unit 1 we solved this problem by making a table and finding the common multiplier. This can be done by the following:

Term	0	1	2	3	4	5	6
Value					2048		131072

b b

So $2048*b^2 = 131072$ We need to divide by 2048 and we find out that b^2 is 64. Which means that b is 8. You could then work backwards to find U_0. This is making a connection to Unit 1.

Term	0	1	2	3	4
Value	$\frac{1}{2}$	4	32	256	2048

8 8 8 8

So our final equation is $y = U_0*b^x$ or in this case it is $y = \frac{1}{2}*8^x$

Check: You can now enter your equation into your GDC (Graphic Display Calculator) and verify.

Method #2: Step 1: Pick 2 points on the graph. In this case I will pick (4,2048) and (6,131072)

Step 2: Substitute the given points into the equation $y= a*b^x$

Using the point (4,2048) I now have $2048=ab^4$	Using the point (6,131072) I now have $131072=ab^6$

Step 3: I have 2 equations that are representing the same curve. I can divide the two equations to find the missing geometric ratio "b"

$\frac{131072=ab^6}{2048=ab^4}$ Now we can simplify. Notice that the common factor of a will reduce to 1

$64=b^2$ ⇒ after taking the square root b=8

Step 4: Now just pick 1 of your ordered pairs and the common ratio "b" and substitute those into the equation $y=a*b^x$ and solve for "a" so you can write your final equation.

Point (4,2048) b value is 8 ⇒ $2048=a(8)^4$ ⇒ $2048=4096a$ This gives us an a value of $\frac{1}{2}$. So the final equation is given by

$Y=\frac{1}{2}*8^x$

Check: You can now enter your equation into your GDC (Graphic Display Calculator) and verify.

Method #3 More in depth showing algebraic substitution:

I know that $2048=a*b^4$ and I know that $131072=ab^6$ However we know that $131072=ab^6$ can be written like the following: $131072=(ab^4)b^2$ ⇒ we know that $ab^4 = 2048$ so substitute that in for where you see the ab^4 and we now get $131072=2048b^2$. By dividing both sides by 2048 we get ⇒ $64=b^2$ so b=8

We now have $y=a*8^x$ and you now substitute an ordered pair in for x and y and solve for a.

Ordered pair (4,2048) and b =8 so we have $2048=a*8^4$ ⇒ $2048=4096a$ ⇒ $a=\frac{1}{2}$

So the final equation is $y=\frac{1}{2}*8^x$

You now have 3 different ways to show your work to write the equation of a curve in the form $y = a*b^x$

You may use the method that is easiest to you.