Warm Up: a) $(2a^2bc^3)(-6a^4bc)^{-2}$ b) $\left(\frac{16}{81}\right)^{-\frac{3}{4}}$

U4D4__MCR3UI **Exploring Properties of Exponential Functions**

Investigation:

1. Complete the following tables.

i)

x	y=x
0	
1	
2	
3	
4	
5	
6	

ii)

x	y=2x
0	
1	
2	
3	
4	
5	
6	

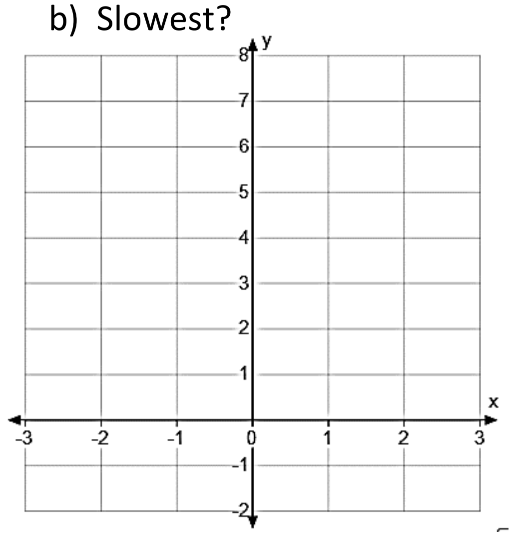
iii)

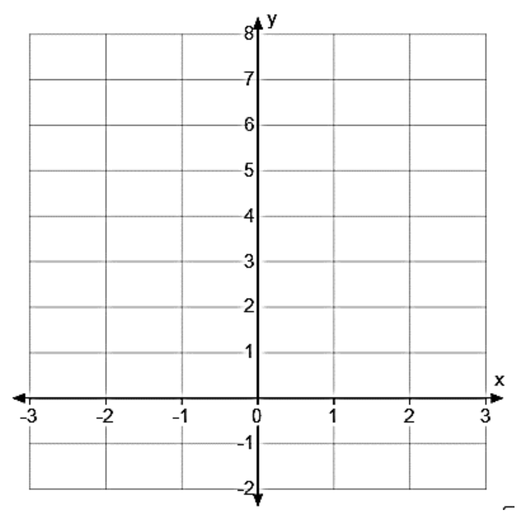
x	$y=x^2$
0	
1	
2	
3	
4	
5	
6	

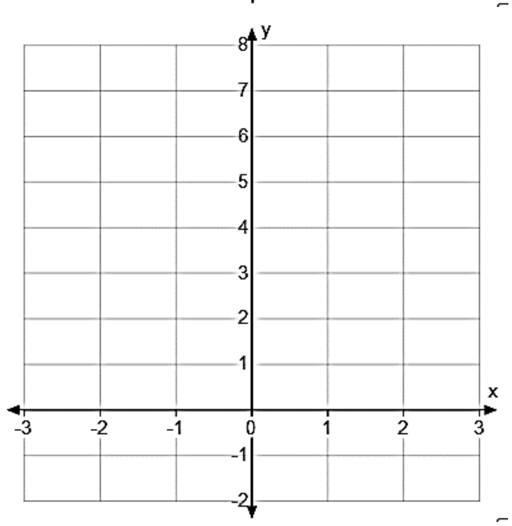
iv)

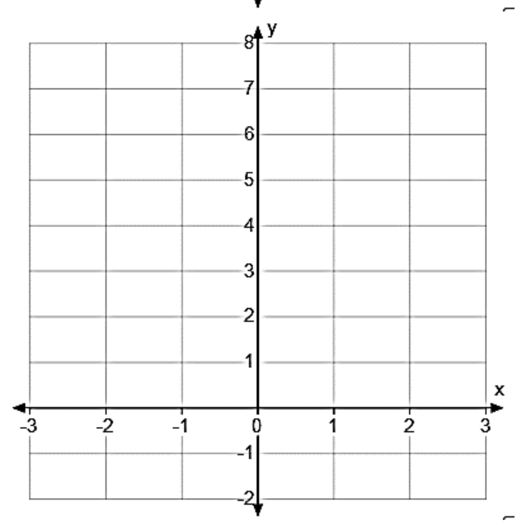
x	$y=2^x$
0	
1	
2	
3	
4	
5	
6	

2. Which pattern is growing:
   a) Fastest?
   b) Slowest?









3. Complete the First and second differences.

x	y=x	First Differences	Second Differences
0	0		
1	1		
2	2		
3	3		
4	4		
5	5		
6	6		

x	y=2x	First Differences	Second Differences
0	0		
1	2		
2	4		
3	6		
4	8		
5	10		
6	12		

x	$y=x^2$	First Differences	Second Differences
0	0		
1	1		
2	4		
3	9		
4	16		
5	25		
6	36		

x	$y=2^x$	First Differences	Second Differences
0	1		
1	2		
2	4		
3	8		
4	16		
5	32		
6	64		

4. What do you notice about the finite differences?

5. Complete the following tables.

i)

ii)

x	$y=3^x$	First Differences	Second Differences
0			
1			
2			
3			
4			

x	$y=0.5^x$	First Differences	Second Differences
0			
1			
2			
3			
4			

6. How do $y = 3^x$ and $y = 0.5^x$ compare with $y=2^x$?

7. Complete the following chart.

	$y=2^x$	$y=3^x$	$y=0.5^x$
Domain			
Range			
x-intercepts?			
y-intercept			
Interval of increase			
Interval of decrease			
Description of graph			
Sketch of graph			
Asymptotes ?			

8. Sam's mom told him that if he consistently does all of his chores, each day she will give him double the amount that was given the previous day. She gives him $0.50 the first day.
   (a) Assuming Sam does his chores consistently, how much money will his mom give him on the fourth day?

   (b) Sam is saving up to buy a new $300 graphics card for his computer. On what day can he buy his graphics card?

Properties of Exponential Functions:

- As the independent variable increases by a constant amount, the dependent variable increases by a _____ _____. (As the independent variable increases by one, the dependent variable increases by a _____ _____ equal to the _____ of the exponential function.)
- The _____ of consecutive finite differences is a constant.
- For bases _____ than 1, the graph _____ at a constant rate (the slope of the graph gets steeper as x increases)
- For bases _____0 and 1, the graph _____ at a constant rate (the slope of the graph gets less steep as x increases)
- $b^0 = 1$, for all $b \epsilon R$, $b \neq 0$