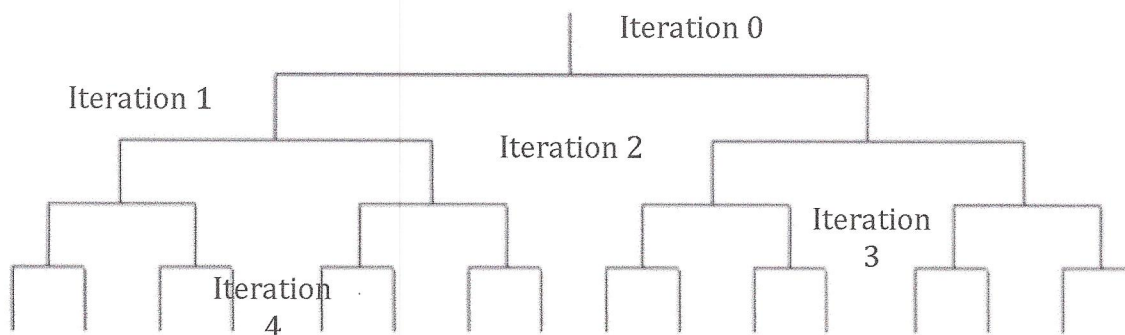


Name: _____

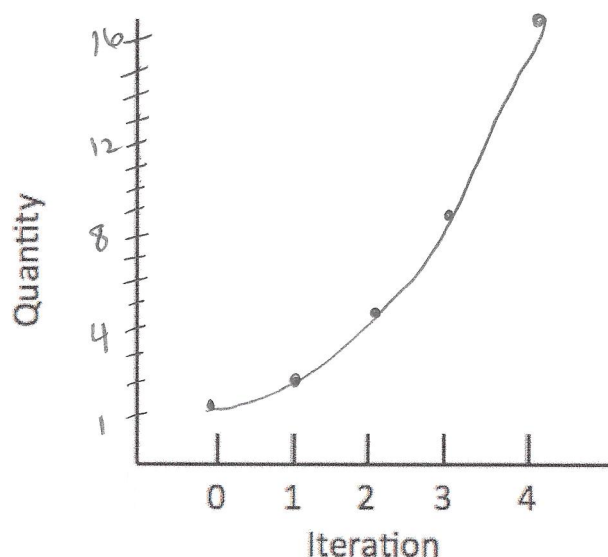
Fractals and Exponents

Based on the images in this exercise, fill in the tables using the power expression and the quantity per iteration and graph your results. You have to write in the tick marks for the Y axis and write the associated numbers. Do not use a calculator for this – write out your math!

Powers of 2



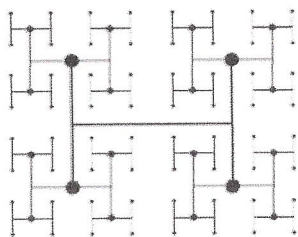
Iteration	Power	How many lines?
0	2^0	1
1	$2^1 = 2 \times 1$	2
2	$2^2 = 2 \times 2$	4
3	$2^3 = 2 \times 2 \times 2$	8
4	$2^4 = 2 \times 2 \times 2 \times 2$	16



2. What kind of a line is your graph?

exponential curve

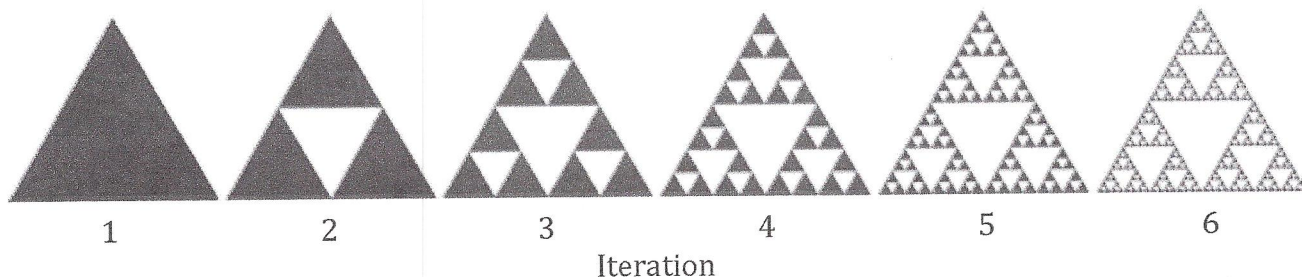
3. Write an equation for your graph in the form: $Y = 2^x$



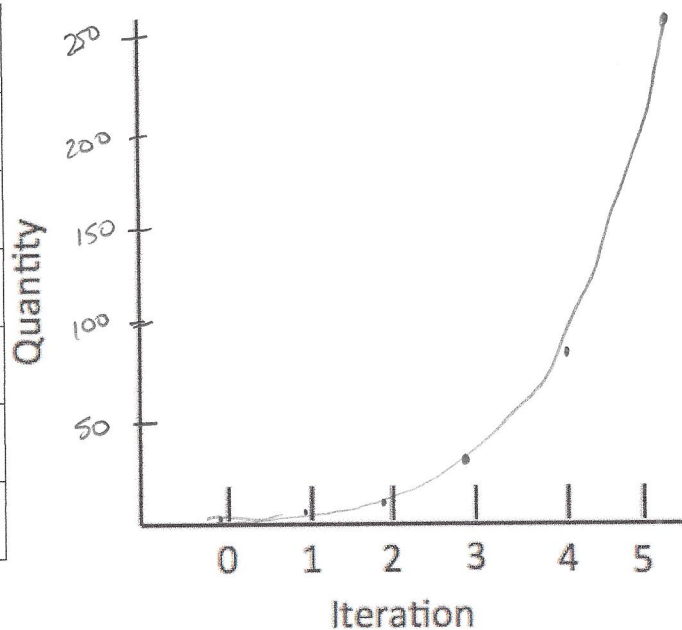
Name: _____

Fractals and Exponents

Powers of 3



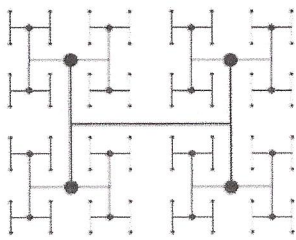
Iteration	Power	How many black triangles?
0	3^0	1
1	$3^1 = 3 \times 1$	3
2	$3^2 = 3 \times 3$	9
3	$3^3 = 3 \times 3 \times 3$	27
4	$3^4 = 3 \times 3 \times 3 \times 3$	81
5	$3^5 = 3 \times 3 \times 3 \times 3 \times 3$	243



4. What kind of a line is your graph?

exponential curve

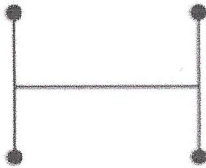
5. Write an equation for your graph in the form: $Y = 3^x$



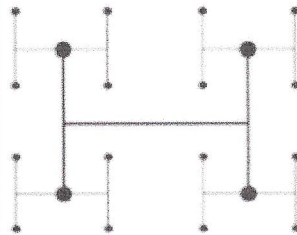
Name: _____

Fractals and Exponents

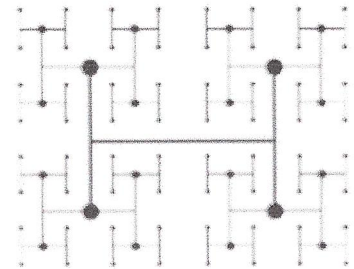
Powers of 4



1



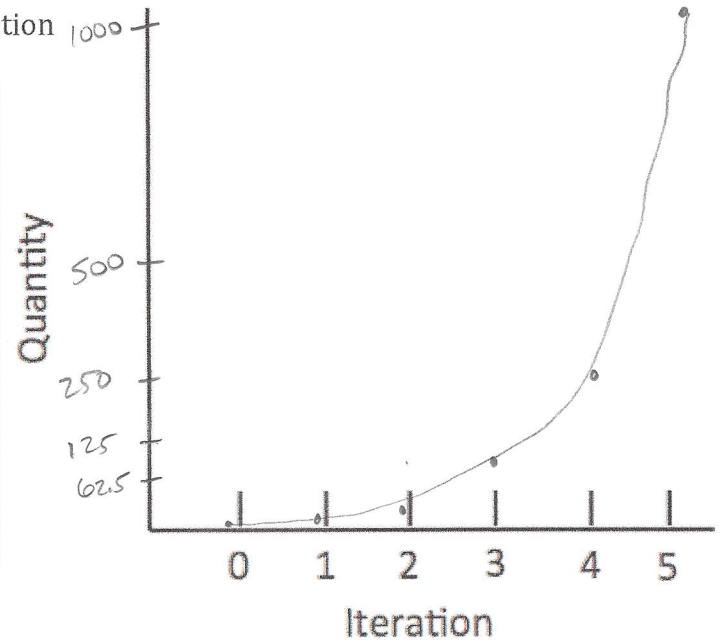
2



3

Iteration 1000

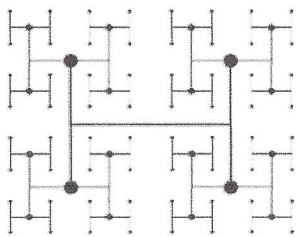
Iteration	Power	How many black dots?
1	$4^1 = 4 \times 1$	4
2	$4^2 = 4 \times 4$	16
3	$4^3 = 4 \times 4 \times 4$	64
4	$4^4 = 4 \times 4 \times 4 \times 4$	256
5	$4^5 = 4 \times 4 \times 4 \times 4 \times 4$	1024



6. What kind of a line is your graph?

exponential curve

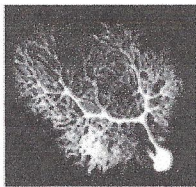
7. Write an equation for your graph in the form: $Y = 4^x$



Name: _____

Fractals and Exponents

Powers of 10



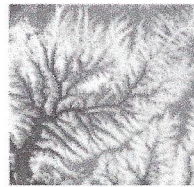
Neuron
 .1mm
 $.0001 \text{ m}$ 10^{-4} m



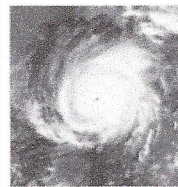
Nautilus
 10 cm
 10^{-1} m



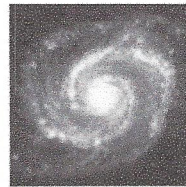
Oak Tree
 10 m
 10^1 m



River Network
 100 km
 10^5 m



Hurricane
 1000 km
 10^6 m



Galaxy
 $10000000000000000 \text{ m}$
 10^{16} m

Now, compare the sizes of the items above. Write down the math you did to come up with your answer and express your answer as a power of 10 as well as a number.

8. How much bigger is the river network than the oak tree?

$$10^5 / 10^1 = 10^{(5-1)} = 10^4 = 10,000 \text{ times as large}$$

9. How much bigger is the galaxy than the nautilus shell?

$$10^{16} / 10^{-1} = 10^{(16-(-1))} = 10^{16+1} = 10^{17} \text{ times as large}$$

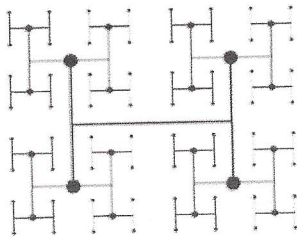
10. How much smaller is the neuron to the hurricane?

$$10^{-4} / 10^6 = 10^{-4-6} = 10^{-10} \text{ times as small}$$

$1/10,000,000,000$
 10 billionth

11. How much smaller is the nautilus to the river network?

$$10^{-1} / 10^5 = 10^{-1-5} = 10^{-6} = 1/1,000,000 = 1 \text{ millionth times as small}$$



Name: _____

Fractals and Exponents

Now we're going to see how some things around you compare in size.

12. Using a measuring tape, measure the items listed below. Be sure to measure in centimeters! You can use a calculator to figure out the ratios or just round your numbers up.

Item	Length (cm)	Ratio of item below to item above, rounded to nearest whole number
Width of your finger	2 cm.	Not applicable
Length of desk	61 cm	$61/2 = 30.5$
Your height	175	$175/61 = 2.87$
Width of classroom		
Length of classroom		

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