

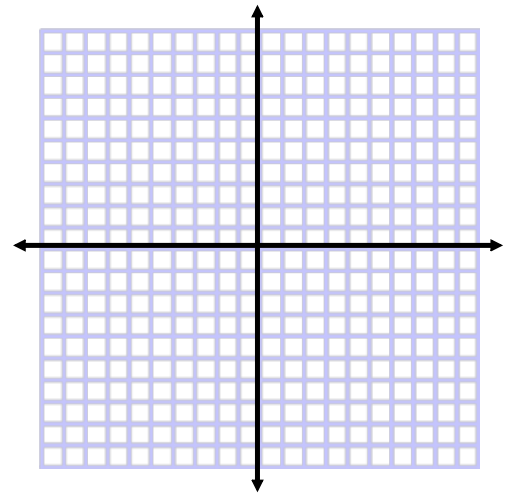
3.7 Negative and Zero Exponents

Ex. 1 Complete the table of values for $y = 2^x$. Graph $y = 2^x$.

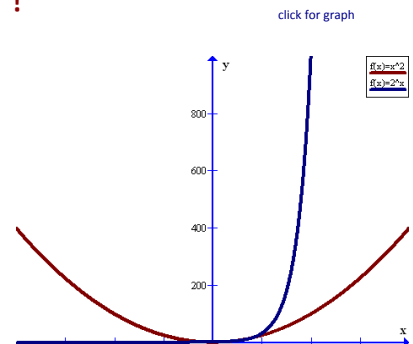
x	$y=2^x$
5	
4	
3	
2	
1	
0	

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

no decimals...use fractions



Describe the graph. How does it compare to $y = x^2$?



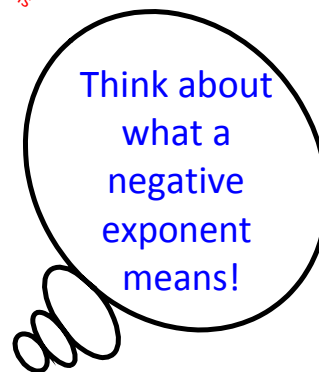
Will the graph ever cross the x-axis? Explain.

Ex. 2 Complete the table for $y = 3^x$.

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

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

no decimals...use fractions



Think about
what a
negative
exponent
means!

Ex. 3 Use the pattern in the previous examples to determine the value of:

a) 4^{-1}

b) 5^{-2}

c) 7^{-3}

d) 4^{-2}

e) 5^0

f) 4^0

g) 9^0

h) 435^0

Rule: for any non-zero base "a"

$$a^0 = 1 \quad \text{and} \quad a^{-k} = \frac{1}{a^k}$$

Ex. 4 Evaluate. No decimals.

a) 2^{-3}

b) 3^{-4}

c) 5^{-3}

d) 6^{-2}

e) $(-2)^{-4}$

f) $(-3)^{-1}$

g) $(-4)^{-3}$

h) -5^{-2}

Ex. 5 Evaluate. No decimals.

a) $\left(\frac{1}{4}\right)^{-2}$

b) $\left(\frac{-2}{3}\right)^{-3}$

c) $\left(\frac{-1}{5}\right)^{-1}$

d) $\left(\frac{4}{3}\right)^{-2}$

Ex. 6 A bacteria colony decays by $\frac{1}{2}$ of its original population every 5 hours.

- a) What fraction remains after 20 hours? 30 hours? 50 hours? **Positive Exponent**
- b) Write each fraction from a) as a power with a negative exponent. **Negative Exponent**
- c) If the colony started with 32768 bacteria. How many remain after 25 hours?