

## Exponent Law Quiz

$$\begin{aligned} \text{a) } \frac{a^5}{a^2} \\ = a^3 \end{aligned}$$

$$\begin{aligned} \text{b) } (x^3 y^2)^0 \\ = 1 \end{aligned}$$

$$\begin{aligned} \text{c) } x^3 x^5 \\ = x^8 \end{aligned}$$

$$\begin{aligned} \text{d) } (2p^5)^3 \\ = 2^3 (p^5)^3 \\ = 8 p^{15} \end{aligned}$$

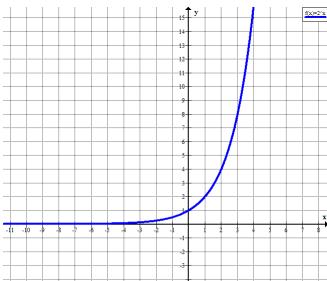
$$\begin{aligned} \text{e) } \left(\frac{a^2}{b}\right)^{-3} \\ = \left(\frac{b}{a^2}\right)^3 \\ = \frac{b^3}{a^6} \end{aligned}$$

$$\begin{aligned} \text{f) } \frac{a^2 \times a^2}{a^3 \times a} \\ = \frac{a^4}{a^4} \\ = a^{4-4} \\ = a^0 \\ = 1 \end{aligned}$$

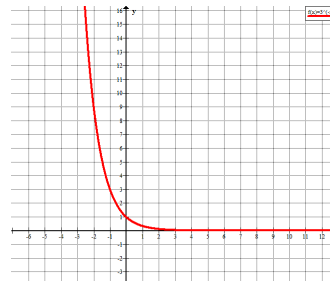
$$\begin{aligned} \text{g) } \left(\frac{2x^2}{y^3}\right)^{-2} \\ = \left(\frac{y^3}{2x^2}\right)^2 \\ = \frac{y^6}{2^2 x^4} \\ = \frac{y^6}{4x^4} \end{aligned}$$

### 3.3A Exponential Relationships

The graph of an exponential relation is a smooth curve that is almost horizontal at one end and increases or decreases rapidly at the other end.

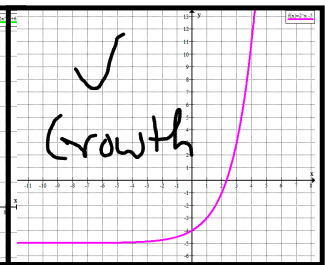
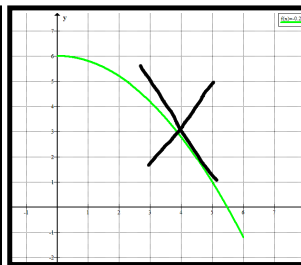
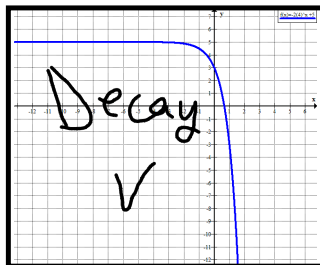
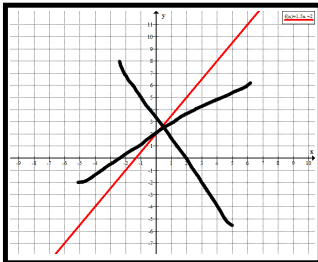


This function represents exponential growth ...it is increasing rapidly.



This function represents exponential decay ...it is decreasing rapidly.

Ex. 1 Which graph could represent an exponential function?



The following table shows exponential growth:

x	f(x)
0	1.0000
1	5.0000
2	25.0000
3	125.0000
4	625.0000
5	3125.0000

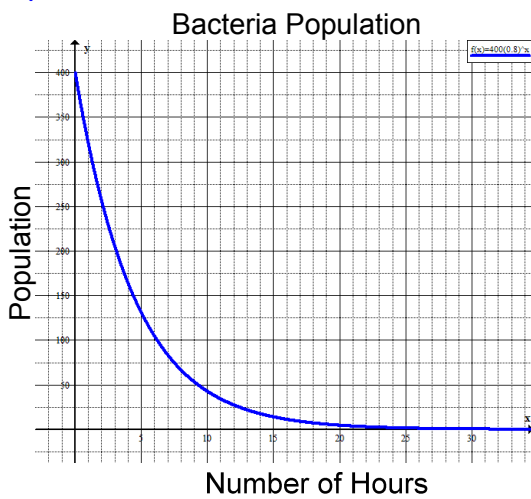
↓ × 5  
↓ × 5  
↓ × 5  
↓ × 5  
↓ × 5

Growth is exponential if there is a common ratio for consecutive values in the table.

(we have to look at first differences to see the ratio)

(Recall linear relations have a common first difference and quadratic relations have a common second difference)

Ex. 2 The graph shows the population of a bacteria colony in a lab, after an antibiotic has been applied.



a) What was the initial population? 400

b) Describe the shape of the graph.

Exponential decay

c) Estimate the population after 10 hours.

~45

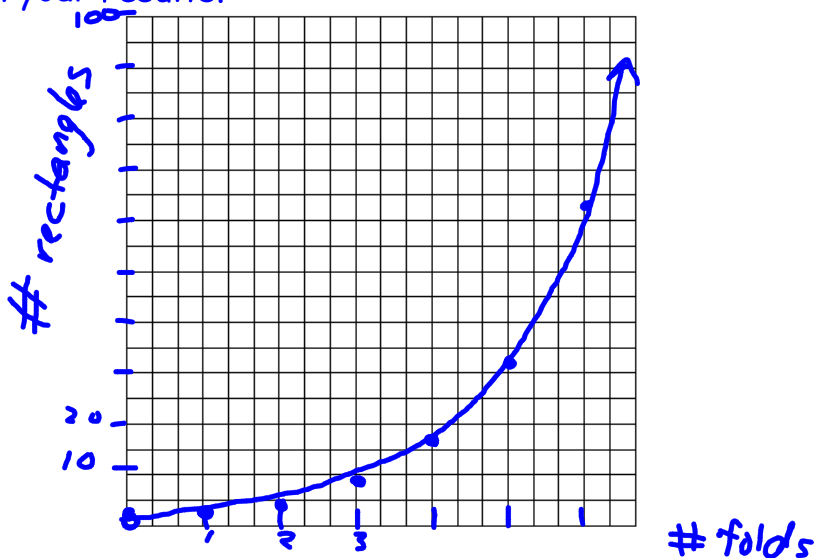
d) When was the colony wiped out?

~30 hours

Ex. 3 Take a regular 8.5" x 11" piece of paper and fold it in half...then in half again...and so on. Record the # of rectangles created on the paper by each successive fold. Graph your results.

# folds	# rectangles
0	1
1	2
2	4
3	8
4	16
5	32
6	64
7	128

x 2  
x 2  
x 2  
x 2  
x 2  
x 2  
x 2  
,



a) Is this relationship exponential? Explain how you know.

Shape, common ratio

b) Does the relation model growth forever? Explain. **Mythbusters**

With 8.5" x 11" paper? Growth does not continue. Cannot continue to fold

Ex 4

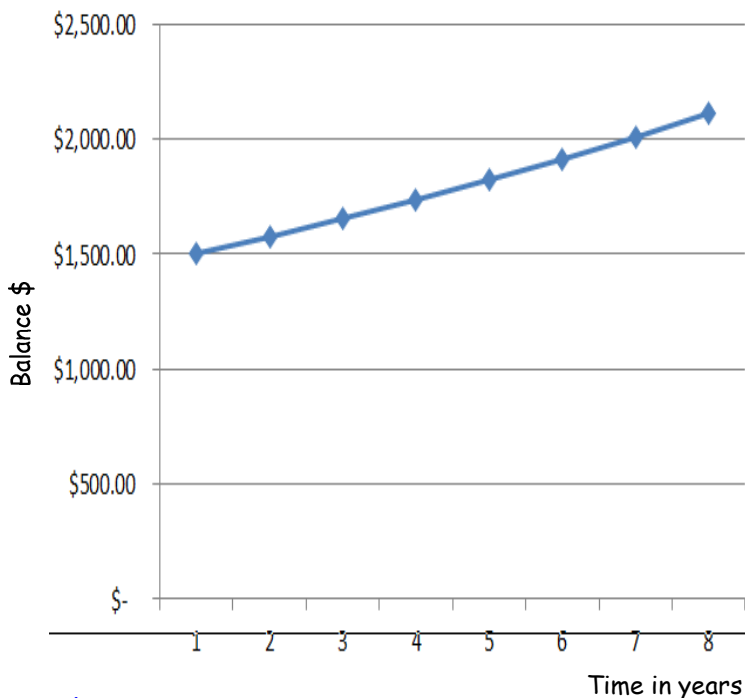
Sarah invests \$1500 into an account that pays 5% compound interest per year. This means that Sarah earns 5% of the balance in interest every year.

$$\begin{array}{l}
 \text{Balance + Interest} \\
 100\% + 5\% \\
 1 + 0.05 \\
 1.05 \quad \text{(constant ratio)}
 \end{array}$$

- a) Complete the table to show the account balance at the end of each year.
- b) Graph the relationship.

Year	Balance (\$)
0	1500
1	1575
2	1653.75
3	1736.44
4	1823.26
5	1914.42
6	2010.14
7	2110.65
8	2216.18

← Initial value  
↘ × 1.05  
↘ × 1.05  
↘ × 1.05  
↑ Constant Ratio



- c) How long until Sarah has \$2000 in her account?

6 years

- d) Does this example model exponential growth or decay? Explain.

Exponential Growth: constant ratio

- e) What would happen to the shape of the graph if she deposited more money in the account at the end of every year?

Steeper growth

**Homework: Assignment Handout**

