Name: _____ Date: _____ Hour: ___Alg 1____

**Unit 8 Day 3: Exponential Growth and Decay**

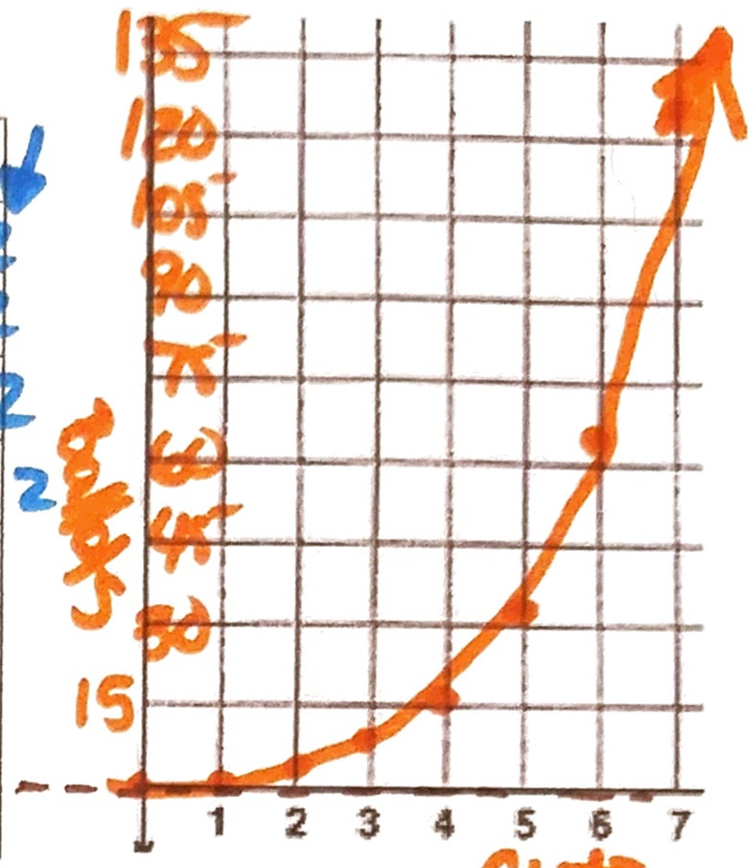
*Focus Question: How can I identify whether a function is growing or decaying?*

A. Making Ballots

Glen is the secretary of the Student Government Association. He is making ballots for a upcoming school vote. He started with one piece of paper and then started cutting the papers in half to create more ballots.

1. Complete the table and graph to show the number of ballots after each of the first 7 cuts.

| Cuts | Ballots |
|---|---|
| 0 | 1 |
| 1 | 2 |
| 2 | 4 |
| 3 | 8 |
| 4 | 16 |
| 5 | 32 |
| 6 | 64 |
| 7 | 128 |




2. Explain how you can tell this is exponential.

it is a multiplicative pattern

3. Using your knowledge of the y intercept and the rate, what is the equation for the function?

$f(x) = a \cdot b^x$ $B(c) = 1 \cdot 2^c$ or $B(c) = 2^c$ cuts

4. When you look at the equation, what is the initial value? 1 What is the base? 2

5. Is the number of ballots getting larger or getting smaller?

The term for this is exponential growth.

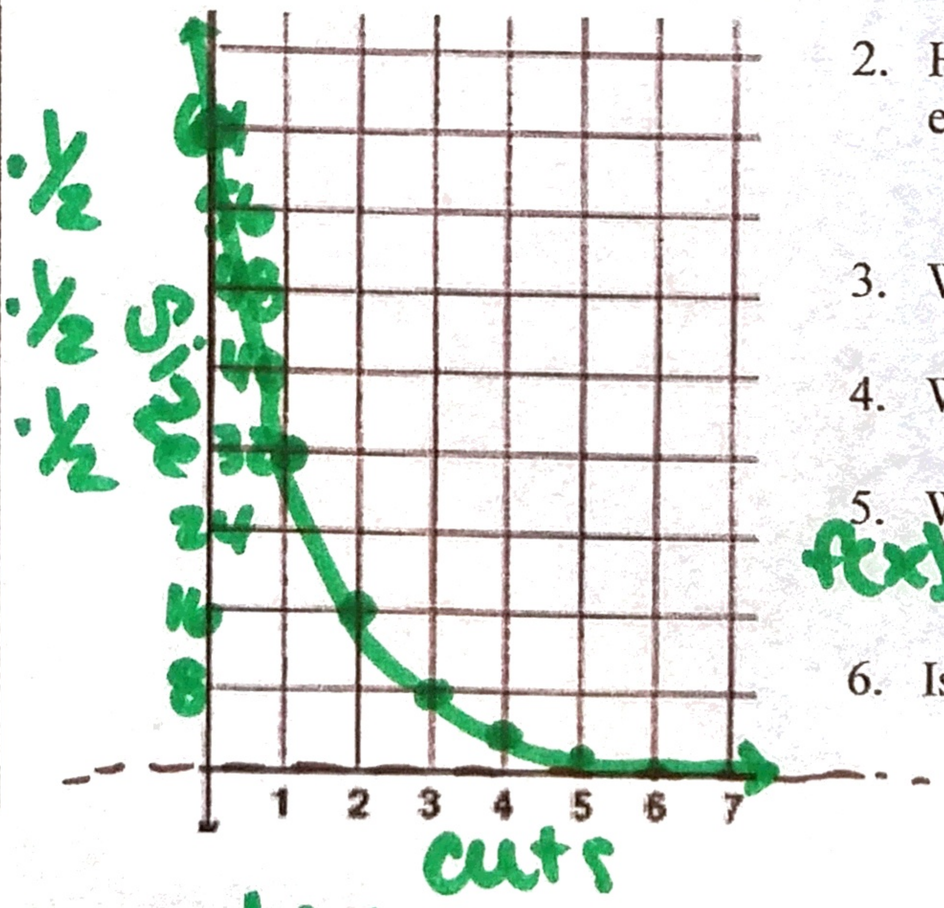
Which part (the initial value or the base) do you think determines it? Explain.

B. Ballot Size

When Glen started making ballots, his paper was 64 square inches. As he cuts the paper in half, each ballot gets smaller and smaller.

1. Fill in just the table and graph after the first 5 cuts.

| Cuts (c) | Size z in sq. inches **(Standard Form)** |
|---|---|
| 0 | 64 |
| 1 | 32 |
| 2 | 16 |
| 3 | 8 |
| 4 | 4 |
| 5 | 2 |




2. How can you tell the function is exponential?

J curve

3. What is the initial value? 64

4. What is the base? ½

5. What is the equation? $f(x) = a \cdot b^x$ $Z(c) = 64\left(\frac{1}{2}\right)^c$

6. Is the size getting larger or smaller? Smaller

The term for this is exponential decay. Which part, the initial value or the base, do you think determines it?

·2 ·6 ·3/2

C. Exponential Growth and Decay

An exponential function is **growth** if the factor (or base) is greater than 1

An exponential function is **decay** if the factor (or base) is between 0 and 1.

·1/2 ·1/4 ·2/3

Identify if each equation below represents growth or decay. Explain your answer.

1) $y = \frac{1}{2} \cdot 5^x$

base = 5

5 > 1

growth

2) $y = 4 \cdot \left(\frac{2}{3}\right)^x$

base = 2/3

2/3 < 1

decay

3) $y = 2 \cdot \left(\frac{8}{5}\right)^x$

base = 8/5

8/5 > 1

growth

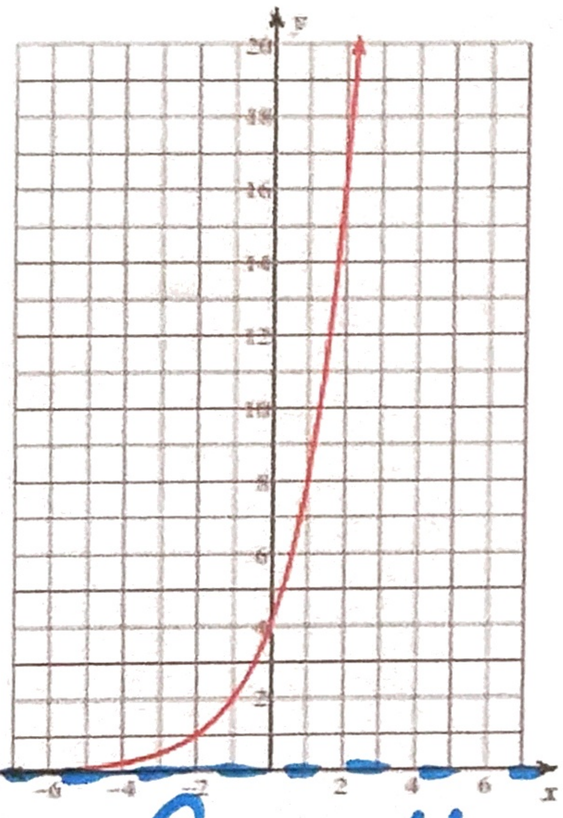
4) $y = \frac{4}{3} \cdot \left(\frac{7}{10}\right)^x$

7/10 is base

7/10 < 1

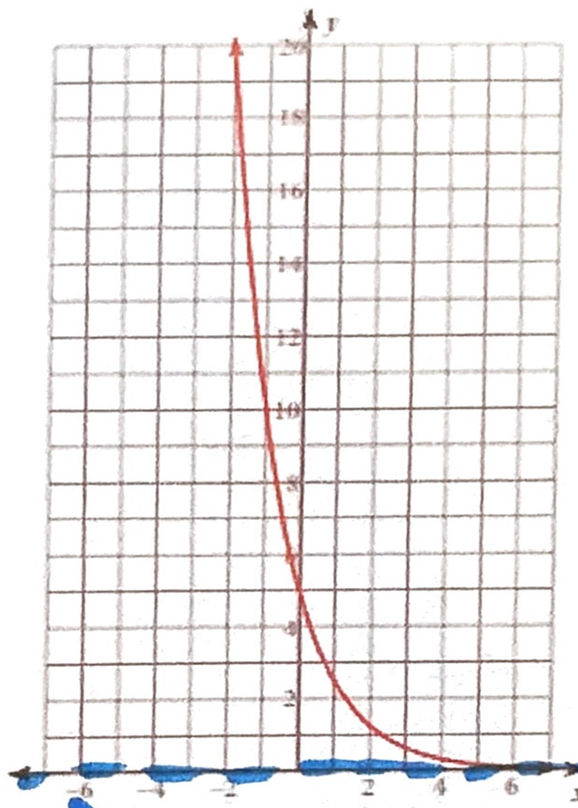
decay

D. Decide if each graph is exponential growth or decay. Give the equation of the asymptote.



Growth

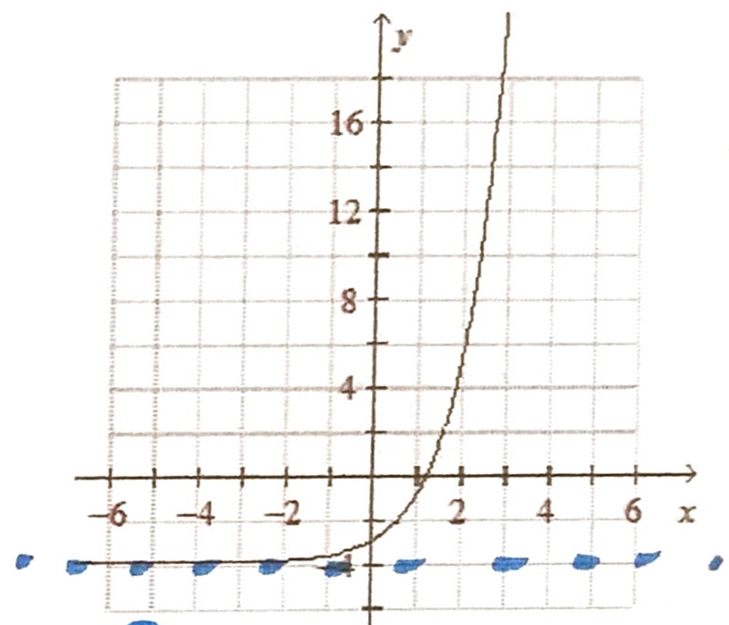
asym: y = 0



Decay

y = 0

R: (0, ∞)



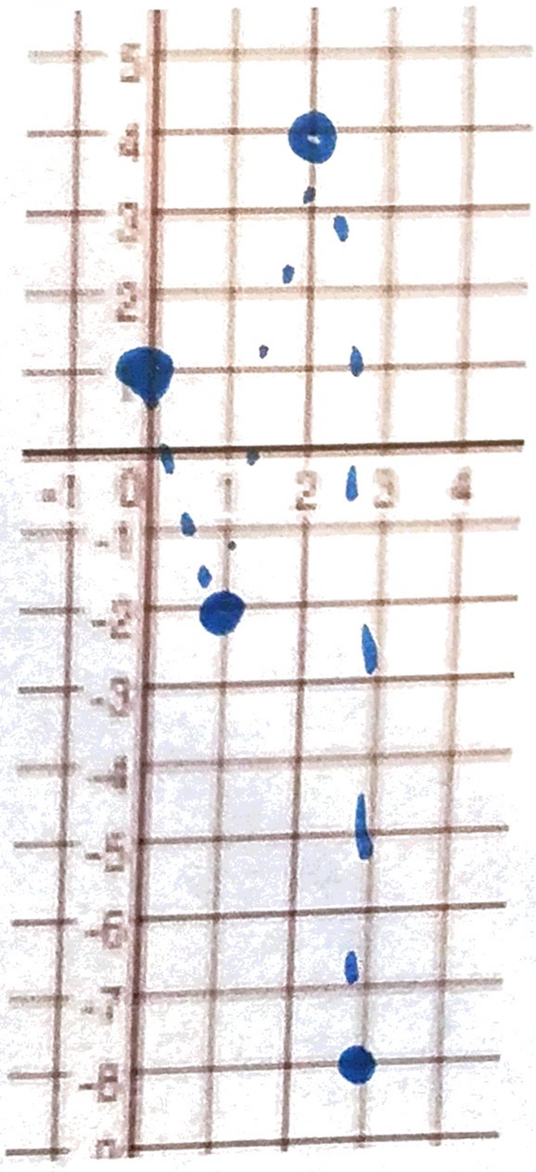
Growth R:

y = -4 (-4, ∞)

E. Can exponential functions have a negative base?

Fill in the table and graph for $y = 1 \cdot (-2)^x$

| Input (x) | Equation looks like | Math looks like | Output (y) |
|---|---|---|---|
| 0 | $y = (-2)^0$ | $(-2)^0$ | 1 |
| 1 | $y = (-2)^1$ | $-2$ | $-2$ |
| 2 | $y = (-2)^2$ | $(-2)(-2)$ | 4 |
| 3 | $y = (-2)^3$ | $(-2)(-2)(-2)$ | $-8$ |



(1, -2)

(2, 4)

(3, -8)