5.3: Exponential vs. Linear Functions

SWBAT distinguish between linear and exponential functions and describe the differences.

Assignments:

HW39

Guppies & Frogs

Guppies and Frogs

Student Activity

Name _____

Class _____

A large pond contains 300 guppies and 160 frogs.

Suppose the guppy population increases by 25 guppies per year.

Suppose the frog population increases by 25% per year.

1. What does the future hold for this pond?
   Make a prediction.

2. What factors might impact the growth of the guppy and frog populations?

3. Use the words NOW and NEXT to write a rule showing how the guppy population changes each year. On the home screen of your calculator, simulate 6 years of guppy growth.

4. Let the function G represent the guppy population at year t. Complete the table.

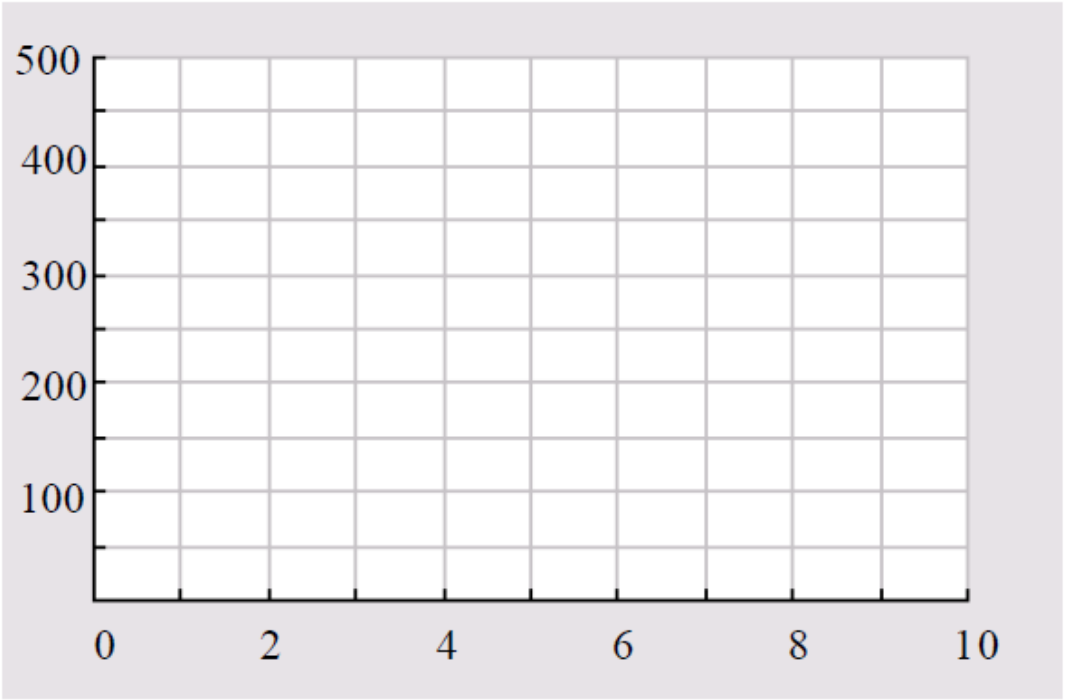
5. How does the guppy population change every 2 years?

Year, t	Guppies, G
0	
1	
2	
3	
4	
5	
6	

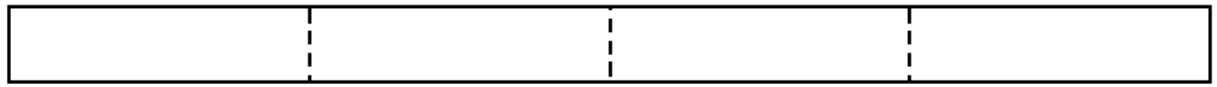
6. Graph the data (t, G) on the set of axes provided. Then, connect the data points.

7. Write a formula to model the population growth.

8. Use your formula to predict the population at year $t = 10$.



9. The initial population of 160 frogs grows by 25% each year.
Suppose the rectangle below represents a population of 160 frogs.



On the grid below, the total rectangle represents the population after the first year of 25% growth.

What is the population of frogs at year $t = 1$? _____

10. On the grid below, the model represents the population after 1 year.
Use the grid to represent the population after 2 years.

What is the population of frogs at year $t = 2$? _____

Does the population increase by the same number of frogs each year? Explain your answer.

11. Use the words NOW and NEXT to write a rule showing how the frog population changes each year. On the home screen of your calculator, simulate 6 years of frog growth.

12. Interpret the meaning of the population at year $t = 3$ in terms of the context of the situation.

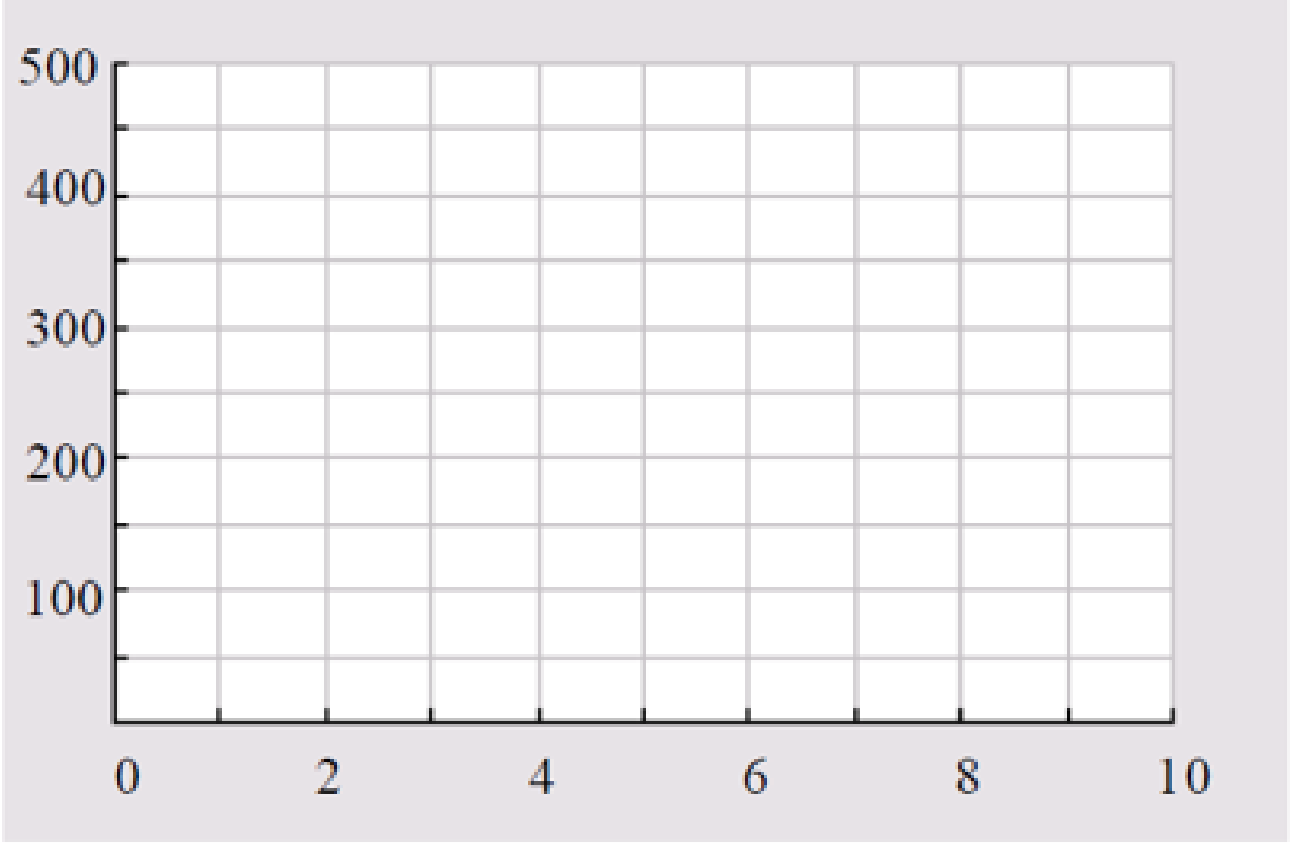
13. Let the function F represent the frog population at year t.
Write a formula that models the population growth of frogs.

14. Use the table feature of your calculator to validate your formula.

    Draw the graph of the frog population on the set of axes on the previous page.

15. In what year does the population of frogs overtake the population of guppies?

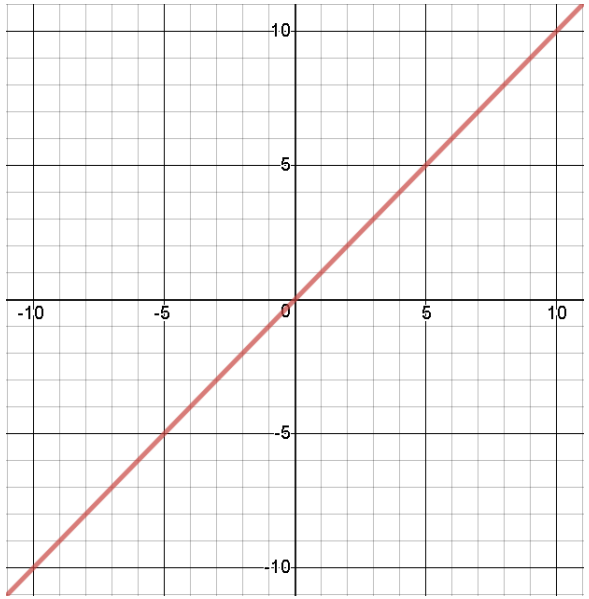
16. List any limitations of these models



Linear vs. Exponential Functions

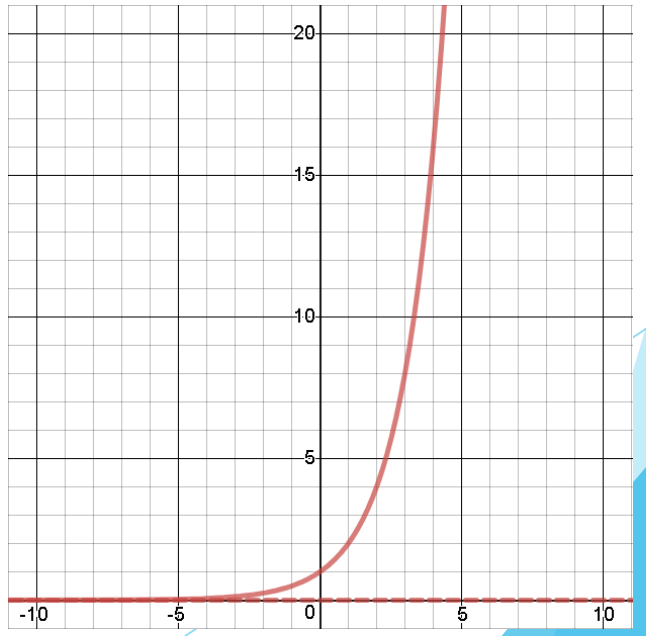
Linear

- $f(x) = mx + b$
- Outputs increase by equal sums
- Graph is a line
  - y-intercept $(0, b)$
  - Domain $(-\infty, \infty)$; Range $(-\infty, \infty)$



Exponential

- $f(x) = a * b^x$
- Outputs increase by equal multiples
- Graph is a curve
  - y-intercept $(0, a)$
  - Domain $(-\infty, \infty)$; Range $(0, \infty)$



Determine if the scenario represents a linear or an exponential function. Then, write a function definition.

- A taxi company charges a $20 flat fee and an additional $0.63 per mile.

- A colony of 24 mice triples in size every month.

Hints:

- Linear:
  - m is the rate of change, the amount that changes
  - b is an initial or starting value
- Exponential:
  - a is the starting value
  - b is the change

Determine if the table represents a linear function, exponential function, or neither. If linear or exponential, write a function definition.

x	$f(x)$
0	4
1	8
2	16
3	32
4	64

x	$g(x)$
0	-1
1	3
2	7
3	11
4	15

x	$h(x)$
0	2
1	10
2	50
3	250
4	1250

x	$m(x)$
0	-4
1	-3
2	0
3	5
4	11