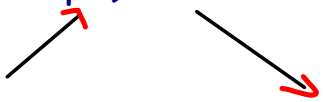
What We Have Learned So Far... 4/12/2021

1. We have learned about linear functions in Units 1 and 2A/2B and quadratic functions in Units 3A and 3B.

2. All functions have graphs: the graph of a linear function is a straight line - decreasing (negative slope) or increasing (positive slope).



3. Standard form of linear function - $Ax + By = C$

Slope-Intercept form of linear equation -

$y = mx + b$ $3x+4=10$

4. Solve linear equations and inequalities in one variable and in two variables.

5. Solve system of linear equations and inequalities.

6. Real life example: Linear equations can be a useful tool for comparing rates of pay. For example, if one company offers to pay you $450 per week and the other offers $10 per hour, and both ask you to work 40 hours per week, which company is offering the better rate of pay? A linear equation can help you figure it out!

6. The graph of a quadratic equation is called Parabola - U-shaped

7. Three forms of quadratic function:
   - Standard form is - $ax^2 + bx + c$
   - Vertex form is - $a(x-h)^2 + k$
   - Intercept form is - $a(x - p)(x - q)$

8. Factor quadratic equations when a = 1; a > 1, using Big X, Area model, factoring special products, taking square roots of both sides, completing the square, and using the quadratic formula.

9. Real life example: When you throw a ball (or shoot an arrow, fire a missile or throw a stone) it goes up into the air, slowing as it travels, then comes down again faster and faster, a quadratic equation tells you its position at all times!

(h, k)
x, y

$$x = \frac{-b}{2a}$$

Essential Questions 4/12/2021

- What are exponential functions?
- How can I evaluate an Exponential Function?

Learning Target

Evaluating Exponential Functions

Day 1 Notes – Exponential Functions $y = ab^x$

Standard(s): MGSE9-12.A.CED.2
Create exponential equations in two or more variables to represent relationships between quantities, graph equations on coordinate axes with labels and scales.

Exploring Exponential Functions
Which of the options below will make you the most money after 15 days?

a. Earning $1 a day?

+1

Linear

x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
y	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

0.01 0.02 0.04

b. Earning a penny at the end of the first day, earning two pennies at the end of the second day, earning 4 pennies at the end of the third day, earning 8 pennies at the end of the fourth day, and so on?

0.08

X2

Exponential

x	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
y	.01	.02	.04	.08	.16	.32	.64	1.28	2.56	5.12	10.24	20.48	40.48	81.92	163.84

Exponential Functions

The general form of an exponential function is:

$y = ab^x$

a represents your start/initial value/y-intercept

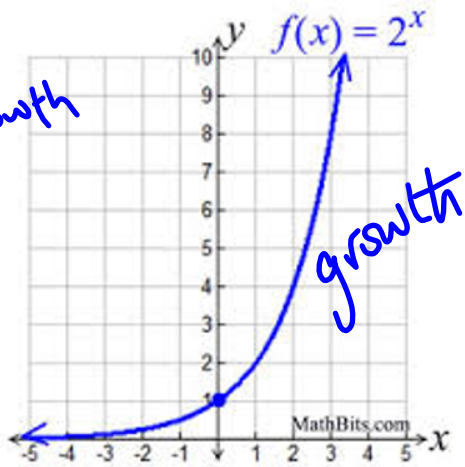
b represents your change or common ratio

Features:

- Variable is in the exponent versus the base
- Start small and increase quickly or vice versa
- Asymptotes (graph heads towards a horizontal line but never touches it)
- Constant Ratios (multiply by same number every time)

$b > 1$ growth

$0 < b < 1$ decay



decay -

① $y = 3(2)^x$ $a = 3$ $b = 2$

growth: $b > 1$

② $y = 3\left(\frac{1}{2}\right)^x$

decay: $b < 1$

③ $y = 0.9(4)^x$

growth: $b > 1$

④ $y = 3(0.9)^x$

decay: $b < 1$

⑤ $y = 4\left(\frac{3}{2}\right)^x$

growth: $b > 1$

$b = 1.5$

⑥ $y = \frac{4}{3}\left(\frac{7}{5}\right)^x$

growth - $b > 1$

⑦ $y = 5\left(\frac{3}{4}\right)^x$ decay

a b $b < 1$

Evaluating Functions

For exponential functions, the variable is in the exponent, but you still evaluate by plugging in the value given.

Practice - I do

Example 1: Evaluate each exponential function.

a. $f(x) = 2(3)^x$ when $x = 5$

growth

$f(5) = 2(3)^5$

$= 2(3)15$

$= 486$

Practice - You do

Evaluate each exponential function.

b. $y = 8(0.75)^x$ when $x = 3$

$f(3) = 8(0.75)^3$

$= 3.375$

decay: b < 1

c. $f(x) = 4^x$, find $f(2)$.

$f(2) = 4^2$

$= 16$

growth

$a = 1$

$b = 4$

Independent Class Practice

Evaluate each exponential function for the stated value.

1. $f(x) = \frac{1}{3}(6)^x$; $x = 2$

$f(2) = \frac{1}{3}(6)^2$

$f(2) = 12$

growth
$b > 1$

2. $f(n) = 10(2)^n$; $f(-2)$

$f(-2) = 10(2)^{-2}$

$= \frac{5}{2}$ or 2.5

$10\left(\frac{1}{2^2}\right)$

3. $y = 4(2)^x$; $x = 4$

a b

$f(4) = 4(2)^4$

$= 64$

growth $b > 1$

4. If a basketball is bounced from a height of 20 feet, the function $f(x) = 20(0.9)^x$ gives the height of the ball in feet of each bounce, where x is the bounce number. What will be the height of the 6th bounce? Round your answer to the nearest tenth of a foot.

$f(6) = 20(0.9)^6$

$= 10.6288$

tenth hundredth thousandths ten thousandths

≈ 10.6 ft

5. The function $f(x) = 10(2)^x$ models an insect population after x weeks. To the nearest whole number, what will the population be after 4 weeks?

A. 80 C. 20,000

B. 160 D. 160,000

$f(4) = 10(2)^4$

Closing: The general form of an exponential function is ?

$y = ab^x$ — rate of change or common ratio

a → Starting point or y-intercept or initial value

Kahoot Review