Chapter 6

Exponential & Logarithmic Functions

Cornell Notes/Summary Sheet

Name: ____________________

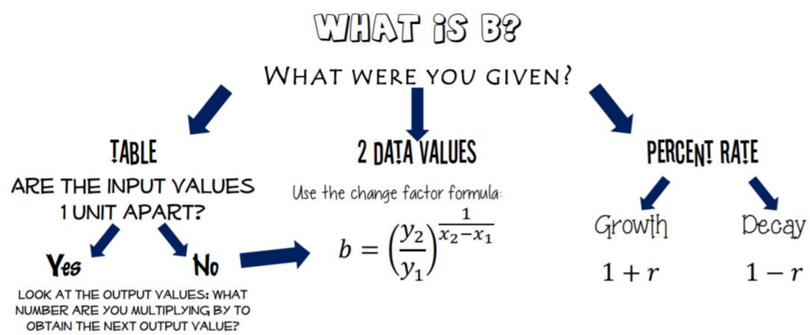
Period: ______

Lesson 6.1 – Big Ideas

- Characteristics of the graph of an exponential function: increasing or decreasing; y-intercept, horizontal asymptote, range, end behavior
- The effects of parameters a & b

- Exponential growth vs. exponential decay
- Successive ratios
- Growth factor vs. growth rate
- Decay factor vs. decay rate

Your Notes



Lesson 6.2 – Big Ideas

- Calculating change factors
- Constructing exponential functions from a contextual situation
- Linear vs. exponential functions
- Change factors
- Constant rate of change vs. percent rate of change
- Constructing a linear function or an exponential function from a contextual situation

Your Notes

Linear Functions

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$y = mx + b$$

① Calculate the change value.

② Substitute and solve for the initial value.

③ Write the function.

Exponential Functions

$$b = \left(\frac{y_2}{y_1}\right)^{\frac{1}{x_2 - x_1}}$$

$$y = a(b)^x$$

Lesson 6.3 – Big Ideas

- Compound interest formula
- Nominal vs. effective rate
- Exponential functions w/base e
- Non-continuous vs. continuous
- Continuous compound interest formula

Your Notes

NON-CONTINUOUS	VS.	CONTINUOUS
$Q = a(b)^t$		$Q = a(e)^{kt}$
$b = 1 + r$	Growth	$k = +r$
$b = 1 - r$	Decay	$k = -r$
Annual % Rate = (base – 1) × 100%		Continuous % Rate = k × 100%
$B = P\left(1 + \frac{r}{n}\right)^{nt}$	Compound Interest	$B = Pe^{rt}$
$\left[\left(1 + \frac{r}{n}\right)^n - 1\right] \times 100\%$	APY	$(e^r - 1) \times 100\%$

Lesson 6.4.D1 – Big Ideas	Your Notes
• Converting between logarithmic & exponential form • Solving exponential equations • Product rule • Quotient rule • Power rule • Solving logarithmic equations • Using natural logarithms to solve exponential equations	Product rule: $\log_b R + \log_b S = \log_b(RS)$ Quotient rule: $\log_b R - \log_b S = \log_b\left(\frac{R}{S}\right)$ Power rule: $\log_b(R^c) = c\log_b R$

Solving Exponential & Logarithmic Equations

EXPONENTIAL

CAN THE BASES BE WRITTEN THE SAME?

NO

Use natural logarithms to solve.

⇩

1. Isolate the exponential expression.
2. Take the natural log of both sides.
3. Simplify using: $\ln b^x = x \ln b$
4. Solve for the variable.

YES

Use the One-to-One Property of Exponents

⇩

1. Same base: $b^M = b^N$
2. Exponents are equal: $M = N$
3. Solve for the variable.

LOGARITHMIC

WHERE IS THE "UNKNOWN"?

OUTSIDE THE LOG?

$\log_b c = M$

Use the definition of logs to convert. Then solve using the One-to-One Property of Exponents.

INSIDE THE LOG?

$\log_b M = c$ $\quad\quad$ $\log_b M = \log_b N$

Is there more than one log on one side of the equation?

NO

Move onto next step.

YES

⇩

Use the product rule or quotient rule to condense the logarithm

What does the equation look like?

$\log_b M = c$

where M contains the variable

Use the definition of logarithm:

$\log_b M = c \rightarrow b^c = M$

⇩

1. Get the log alone.
2. Use definition to convert.
3. Solve for the variable.
4. Check.

$\log_b M = \log_b N$

where M & N contain the variable

Use the One-to-One Property of Logarithms

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1. $M = N$
2. Solve for the variable.
3. Check.

Lesson 6.5 – Big Ideas

- Doubling time
- Half-life
- Converting between $Q = a(b)^t$ & $Q = ae^{kt}$
- Annual growth rates vs. continuous growth rates

Your Notes

	Non-Continuous		Continuous
Function Formula	$Q = a(b)^t$		$Q = ae^{kt}$
Convert	$b = e^k$		$k = \ln b$
Rate Rule	$(b-1) \times 100\%$		$k \times 100\%$
Doubling Time	$2 = b^t$	$2 = (1+r)^t$	$2 = e^{kt}$
Half-Life	$\frac{1}{2} = b^t$	$\frac{1}{2} = (1-r)^t$	$\frac{1}{2} = e^{-kt}$