Exponential Functions Notes

Words	An exponential function can be described by an equation of the form $y = ab^x$, where $a \neq 0$, $b > 0$, and $b \neq 1$.
Examples	$y = 2(3)^x$ $y = 4^x$ $y = (\frac{1}{2})^x$

1. The Richter Scale measures the energy that an earthquake releases and assigns a magnitude to it. These orders of magnitude can be approximated by comparing them to the explosive power of TNT. Determine whether the set of data displays exponential behavior.

Magnitude	TNT (tons)
1	0.6
2	6
3	60
4	600
5	6000
6	60,000
7	600,000
8	6,000,000

) x10

exponential

Start: 0.06

Rate: 10

$y = 0.06(10)^x$

2. After World War II, the television became a major consumer product the United States. The percentage of households with a TV for each year in the 1950s is provided in the table. Determine whether the set of data displays exponential behavior.

No

Year	% of Households with a TV
1950	9
1951	24
1952	34
1953	45
1954	56
1955	65
1956	72
1957	79

Exponential Functions Notes

3. Each time you fold a piece of paper in half, it doubles in thickness. If a piece of paper is 0.05 mm thick, then you can determine the thickness, y, of a piece of paper given the number of folds, x, with the function $y = 0.05(2)^x$. Identify the key features of the function, graph it, and then identify the relevant domain and range in the context of the situation. (Hint: key features of an exponential function are end behavior and y-intercept).

y-int: 0.05

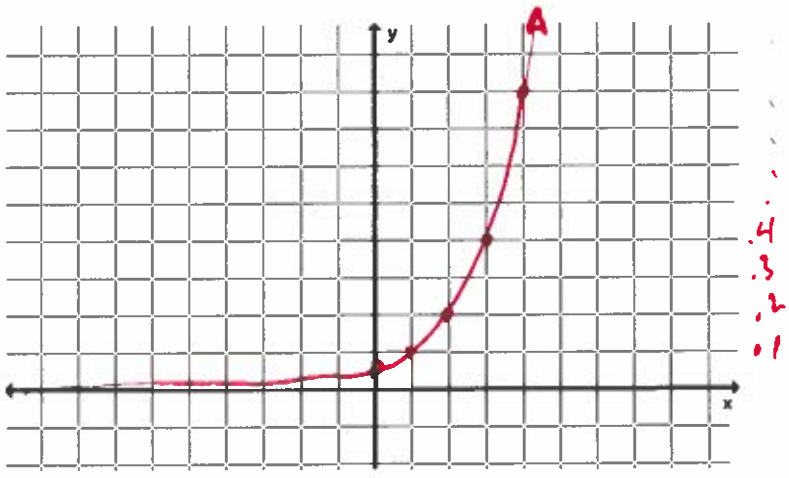
END: x ↑, y ↑

x ↓, Approaches 0

D: ℝ

R: y > 0

0	0.05
1	0.1
2	0.2
3	0.4
4	0.8



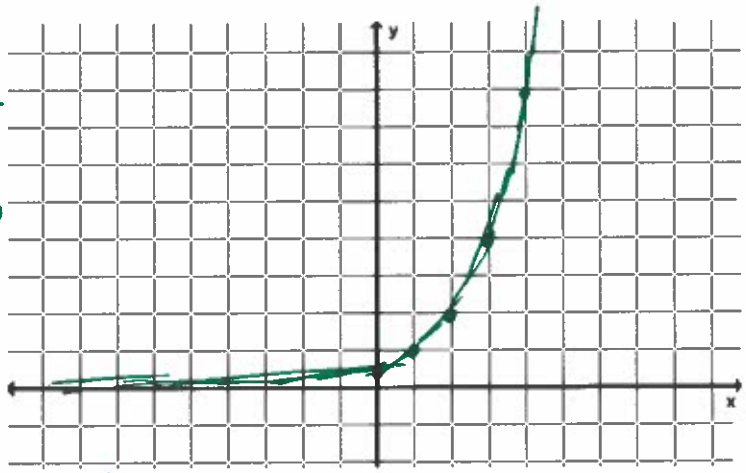
4. Find the domain, range, key features, and graph the function $y = \frac{1}{2} \cdot 2^x$

y-int: ½ or 0.5

E.B.: As x ↑, y ↑

As x ↓, y → 0

x	y
0	½
1	1
2	2
3	4



D: ℝ

R: y > 0

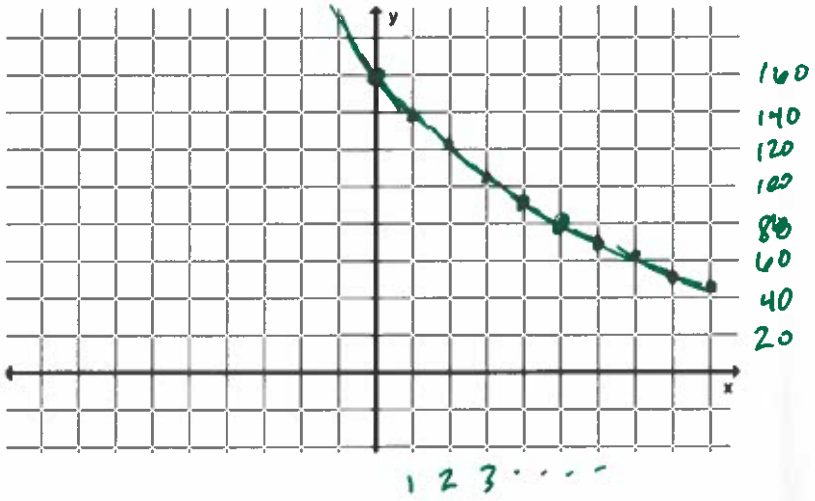
Exponential Functions Notes

5. The half-life of a substance describes how long it takes for the substance to deplete by half. The half-life of caffeine in the body of a healthy adult is approximately 5 hours, meaning that it takes 5 hours before the body can break down half of the caffeine. Suppose an energy drink contains 160 mg of caffeine. The amount of caffeine, y, left in your system after x hours is modeled by the function $y = 160(\frac{1}{2})^{\frac{x}{5}}$. Identify the key features of the function, graph it, and then identify the relevant domain and range in context of the situation.

y-int: 160

END: As $x \uparrow$, y approaches 0

As $x \downarrow$, $y \uparrow$



D: $x \geq 0$

R: $0 < y \leq 160$

6. The function $y = 200(\frac{1}{2})^{x}$ describes the half-life of a commonly used pesticide known as DDT. If a crop were sprayed with 200 grams of DDT, then the amount remaining would be shown by the equation. The half-life of the pesticide was about 15 years.

   a. Find all of the key features and state the domain and range in context.

END: $x \uparrow$, $y \to 0$

$x \downarrow$, $y \uparrow$

y-int: 200

D: $x \geq 0$

R: $0 < y \leq 200$

   b. Graph the function.