Name: Key Period: _____

Exponential vs. Linear Functions Notes

Part I – Graphing Exponential Functions

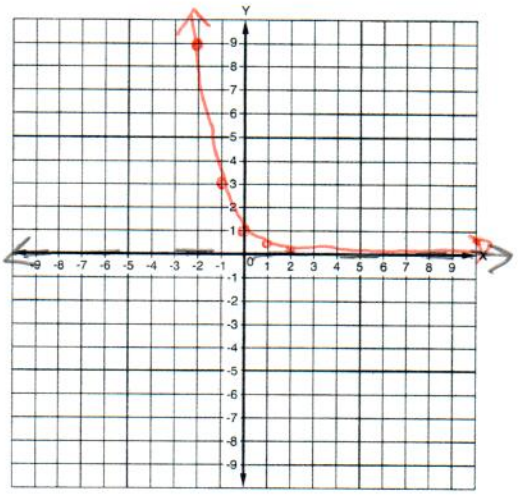
Directions: Graph each exponential function by creating a table and identifying its key characteristics.

1. $y = \left(\frac{1}{3}\right)^x$ stretch/shrink/neither (→ compression)
   growth/decay

   a: 1
   b: 1/3
   h: 0
   k: 0

   domain: $-\infty < x < \infty$
   range: $y > 0$
   y-intercept: (0, 1)
   Asymptote: $y = 0$

x	y
-2	9
-1	3
0	1
1	1/3
2	1/9

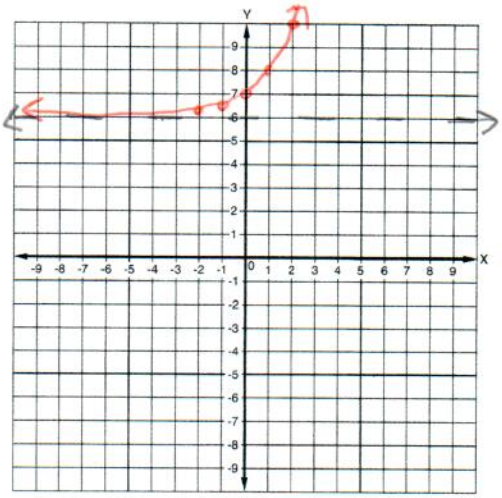


2. $y = 2^x + 6$ stretch/shrink/neither
   growth/decay

   a: 1
   b: 2
   h: 0
   k: 6

   domain: $(-\infty, \infty)$
   range: $y > 6$
   y-intercept: (0, 7)
   Asymptote: $y = 6$

x	y
-2	6.25
-1	6.5
0	7
1	8
2	10

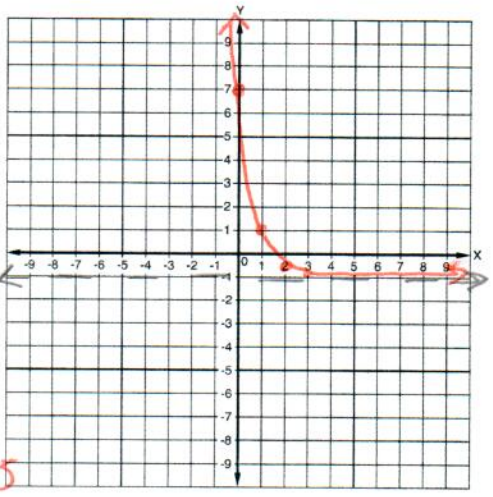


3. $y = 8 \cdot \left(\frac{1}{4}\right)^x - 1$ stretch/shrink/neither
   growth/decay

   a: 8
   b: 1/4
   h: 0
   k: -1

   domain: $-\infty < x < \infty$
   range: $y > -1$
   y-intercept: (0, 7)
   Asymptote: $y = -1$

x	y
-2	127
-1	31
0	7
1	1
2	-0.5
3	-0.875



Review of Exponential Growth/Decay Word Problems:

4. The Mendez family just bought a home for $180,000. If the value of the home increases at a rate of 3% per year, use an exponential function to find the approximate value of the home after 10 years.

$a = 180{,}000$ $y = 180{,}000(1+3\%)^{10}$
$r = 3\%$ $y = 241{,}904.95$
$t = 10$

A. $258,000 B. $250,000
C. $242,000 D. $234,000

5. Doug purchased land for $8,000 in 1995. The value of the land depreciated by 4% each year thereafter. Use an exponential function to find the approximate value of the land in 2002.

$a = 8000$ $y = 8000(1-4\%)^7$
$r = 4\%$ $y = 6011.58$
$t = 2002 - 1995 = 7$

A. $5,760 B. $5,771
C. $6,012 D. $6,262

Part II – Linear vs. Exponential Functions

Exponential Functions: $y = a \cdot b^{x-h} + k$ **or** $f(x) = a \cdot b^{x-h} + k$

- Shows growth/decay at consecutive intervals
- Looks like a normal or backwards "L" or "r" graphically
- **Key words:** increasing, decreasing, lost, depreciate

Linear Functions: $y = mx + b$

- Shows a constant rate of change
- Looks like a straight line graphically
- **Key words:** each, per

6. Decide whether the word problem represents a linear or exponential function. Circle either linear or exponential. Then write the function formula.

a) A library has 8000 books and is adding 500 more books each year.
linear or exponential $y =$ $500x + 8000$

b) A gym's customers must pay $50 for a membership, plus $3 for each time they use the gym.
linear or exponential $y =$ $3x + 50$

c) A bank account starts with $10. Every month, the amount of money in the account is tripled (3).
linear or exponential $y =$ $10(3)^t$ or $10(3)^x$

d) At the start of a carnival, you have 50 ride tickets. Each time you ride the roller coaster, you have to pay 6 tickets.
linear or exponential $y =$ $6x + 50$

e) There are 20,000 owls in the wild. Every decade, the number of owls is halved (2).
linear or exponential $y =$ $20{,}000\left(\frac{1}{2}\right)^x$ or $20{,}000(0.5)^x$

↑ 1 − 50% or 1 − 0.5