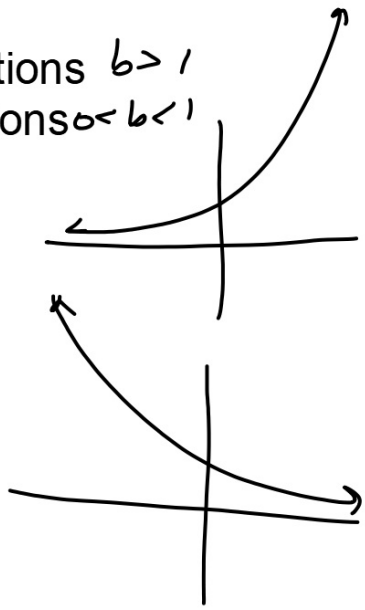
Algebra 2 7.1

Graph exponential growth functions $b > 1$

Graph exponential decay functions $0 < b < 1$



base

exponent

asymptote

domain ARN

range depends $y >$

growth factor $y <$

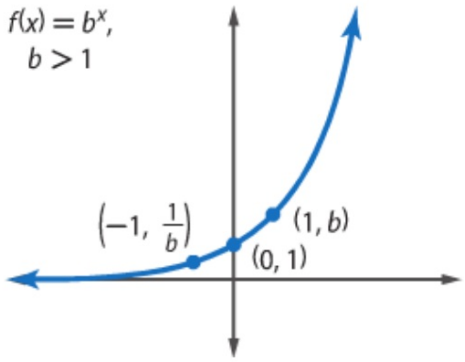
decay factor

whiteboards

graph matching

KeyConcept Parent Function of Exponential Growth Functions

Parent Functions:	$f(x) = b^x, b > 1$
Type of graph:	continuous, one-to-one, and increasing
Domain:	all real numbers
Range:	all positive real numbers
Asymptote:	x-axis
Intercept:	(0, 1)

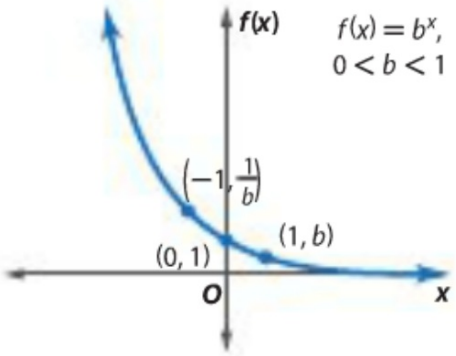


Decay or Decrease

KeyConcept Parent Function of Exponential Decay Functions

Parent Functions:	$f(x) = b^x$, $0 < b < 1$
Type of graph:	continuous, one-to-one, and decreasing
Domain:	all real numbers
Range:	positive real numbers
Asymptote:	x-axis
Intercept:	(0, 1)

Model



KeyConcept Transformations of Exponential Functions

$$f(x) = ab^{x-h} + k$$

h – Horizontal Translation

h units right if h is positive

$|h|$ units left if h is negative

k – Vertical Translation

k units up if k is positive

$|k|$ units down if k is negative

a – Orientation and Shape

If $a < 0$, the graph is reflected in the x-axis.

If $|a| > 1$, the graph is stretched vertically.
If $0 < |a| < 1$, the graph is compressed vertically.

GuidedPractice

4A. $y = 3\left(\frac{2}{5}\right)^{x-4} + 2$

$\left(\frac{2}{5}\right)^{-4}$ $\left(\frac{5}{2}\right)^{4}$

$\left(\frac{2}{5}\right)^{-3}$ $\left(\frac{5}{2}\right)^{3}$

y int (0, 119)

D: all x

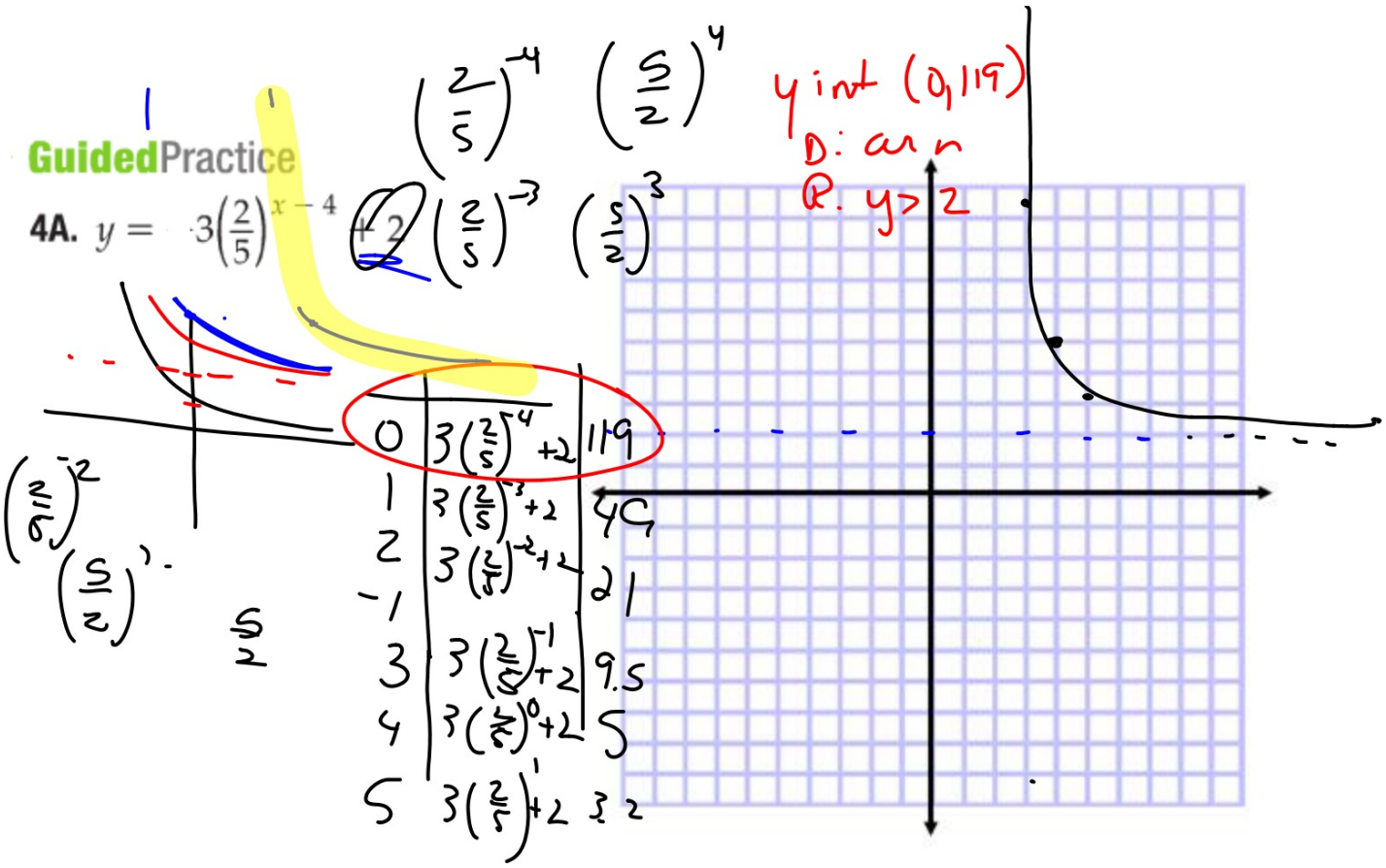
R: $y > 2$

0	$3\left(\frac{2}{5}\right)^{-4}+2$ 119
1	$3\left(\frac{2}{5}\right)^{-3}+2$ 46
2	$3\left(\frac{2}{5}\right)^{-2}+2$ 21
−1	
3	$3\left(\frac{2}{5}\right)^{-1}+2$ 9.5
4	$3\left(\frac{2}{5}\right)^{0}+2$ 5
5	$3\left(\frac{2}{5}\right)^{1}+2$ 3.2

$\left(\frac{5}{2}\right)^{2}$

$\left(\frac{5}{2}\right)^{1}$

$\frac{5}{2}$



$$A(t) = a(1 + r)^t$$

1+r growth factor

$$A(t) = a(1 - r)^t$$

1-r decay factor

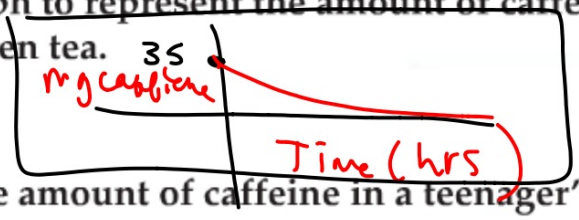
Exponential decrease... $y = 35(1 - 0.125)^t$

Real-World Example 5 Graph Exponential Decay Functions

TEA A cup of green tea contains 35 milligrams of caffeine. The average teen can eliminate approximately 12.5% of the caffeine from their system per hour.

-0.125

a. Draw a graph to represent the amount of caffeine remaining after drinking a cup of green tea.



GeoA

b. Estimate the amount of caffeine in a teenager's body 3 hours after drinking a cup of green tea.

23.4 mg

$y = 35(0.875)^3$

$y = 68(1-0.125)^t$

GuidedPractice

5. A cup of black tea contains about 68 milligrams of caffeine. Draw a graph to represent the amount of caffeine remaining in the body of an average teen after drinking a cup of black tea. Estimate the amount of caffeine in the body 2 hours after drinking a cup of black tea.

$y = 68(0.875)^2$

$y = 52$ mg.