Key

7.1 Day 1 Notes Exponential Functions

parent function: $f(x) = b^x$, where $b > 0$ and $b \neq 1$

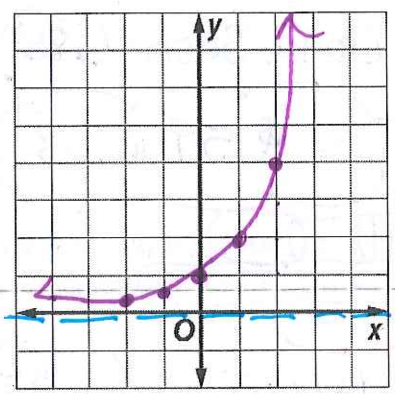
Domain: $\mathbb{R}$ | Horizontal asymptote: $y = 0$ | Graphing exponentials:

Range: $y>0$ | Y intercept $(0,1)$ | critical points: $\left(-1, \frac{1}{b}\right)$; $(0,1)$; $(1, b)$

Exponential Growth: $b > 1$

Graph: $f(x) = 2^x$

x	f(x)
-2	$\frac{1}{4}$
-1	$\frac{1}{2}$
0	1
1	2
2	4



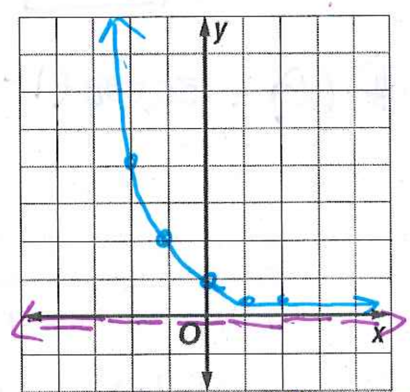
Domain: $\mathbb{R}$ Range: $(0, \infty)$

Asymptote: $y=0$

Exponential Decay: $0 < b < 1$

Graph: $f(x) = \left(\frac{1}{2}\right)^x$

x	f(x)
-2	4
-1	2
0	1
1	1/2
2	1/4

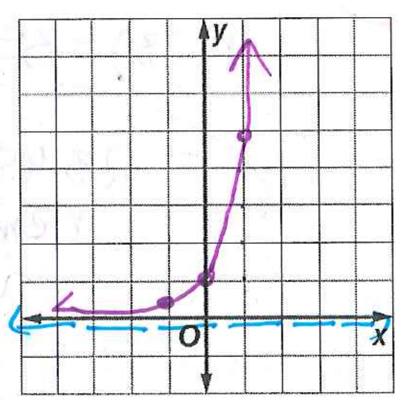


Domain: $\mathbb{R}$ Range: $(0, \infty)$

Asymptote: $y=0$

1. $y = 5^x$ Graph:

x	f(x)
-1	1/5
0	1
1	5
2	25

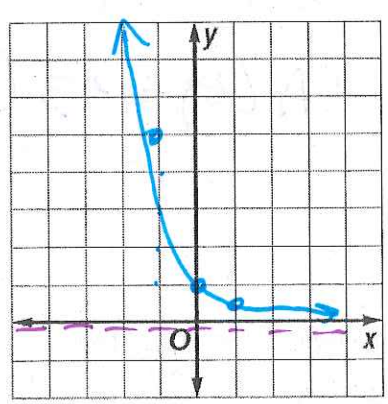


Domain: $\mathbb{R}$ Range: $(0, \infty)$

Asymptote: $y=0$

2. $y = (0.2)^x$ Graph:

x	f(x)
-1	5
0	1
1	1/5
2	1/25



Domain: $\mathbb{R}$ Range: $(0, \infty)$

Asymptote: $y=0$

(+) = appreciation
(−) = depreciation

Growth & Decay at a Constant Rate (%)

$$A(t) = a(1 \pm r)^t$$

beginning amount

rate expressed as a decimal

ending amount

units of time

1. A new SUV depreciates at 15% per year after purchase. Write the equation to model the truck's value in any year if the purchase price was $30,000. How much will the car be worth in 10 years?

$A(t) = 30{,}000(1-.15)^t$

$A(10) = 30{,}000(.85)^{10}$

$= \$5906.23$

2. A computer virus spreads so that every minute 25% more computers are infected. Write the function based on only one computer being infected, then estimate the number of computers affected at the end of one hour.

$A(t) = 1(1+.25)^t$

$A(60) = 1(1.25)^{60}$

$= 652{,}530$ computers infected in one hour.

3. One cup of green tea contains 35 milligrams of caffeine. The average person eliminates 12.5% of the caffeine from their system per hour. Write the decay function to represent the amount of caffeine remaining after drinking one cup of tea, then estimate how much caffeine will be left in your system after 3 hours.

$A(t) = 35(1-.125)^t$

$A(3) = 35(0.875)^3$

$= 23.45$ mg. remaining

Classify each exponential model as exponential growth or exponential decay.

a) $y = 5(.82)^x$
decay

b) $y = .25(1.09)^x$
growth

c) $y = \frac{1}{3}\left(\frac{4}{3}\right)^x$
growth

d) $y = 4(1.2)^x$
growth

e) $y = (1.012)^x$
growth

f) $y = \left(\frac{1}{4}\right)^x$
decay