

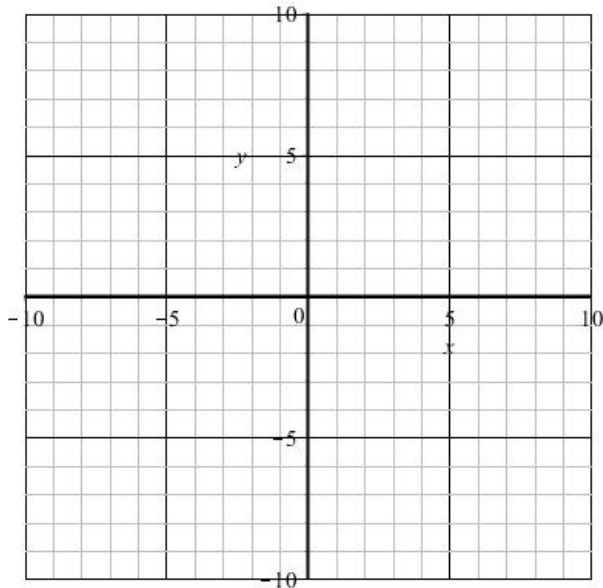
Math 1314 – College Algebra

Section 6.1-6.2 Exponential Functions/Graphs of Exponential Functions

- Exponential functions look like $y = b^x$ or $f(x) = b^x$ where $b > 0, b \neq 1$ and x is a real number.
- Why can b not be 1?

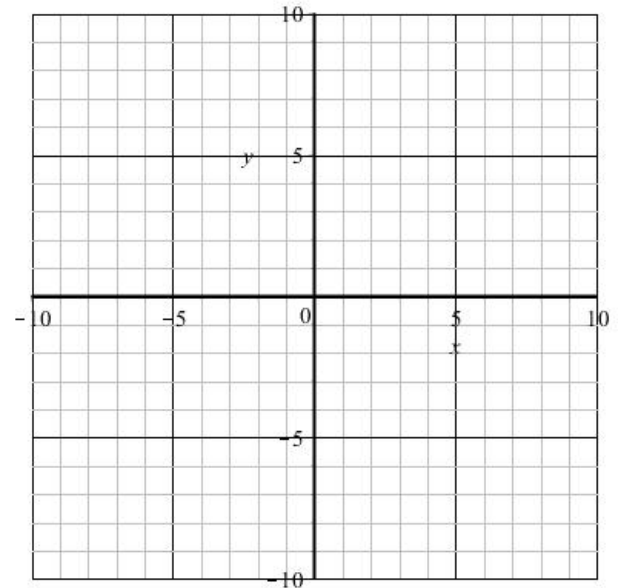
Ex: (a) Graph $f(x) = 2^x$ and $g(x) = \left(\frac{1}{2}\right)^x$. Give the domain, range, and end behavior of both.

(a) $f(x) = 2^x$



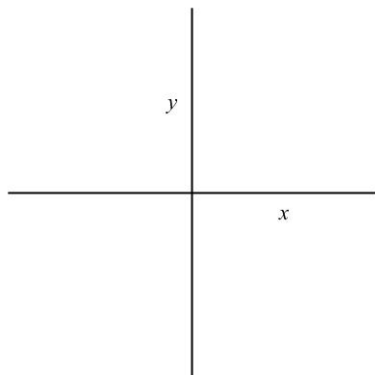
Domain:
 Range:
 End behavior:
 As $x \rightarrow \infty$,
 As $x \rightarrow -\infty$,

(b) $g(x) = \left(\frac{1}{2}\right)^x$

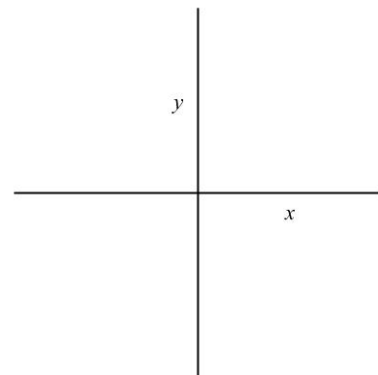


Domain:
 Range:
 End behavior:
 As $x \rightarrow \infty$,
 As $x \rightarrow -\infty$,

If $b > 1$:



If $0 < b < 1$:



■ Properties of Exponential Functions $f(x) = b^x$:

- Domain:
- Range:
- y -intercept: (,)
- _____ asymptote at _____
- Passes through the point (1,)
- If $b > 1$, (Choose from increasing or decreasing)
- If $0 < b < 1$, (Choose from increasing or decreasing)

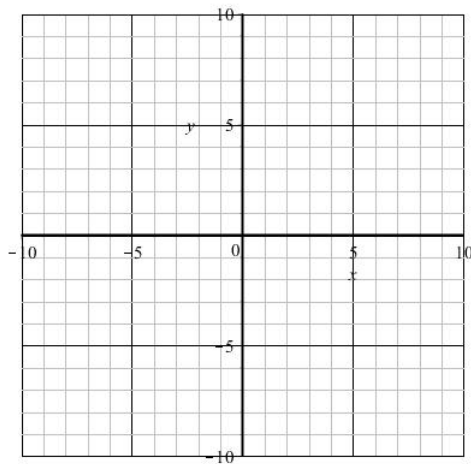
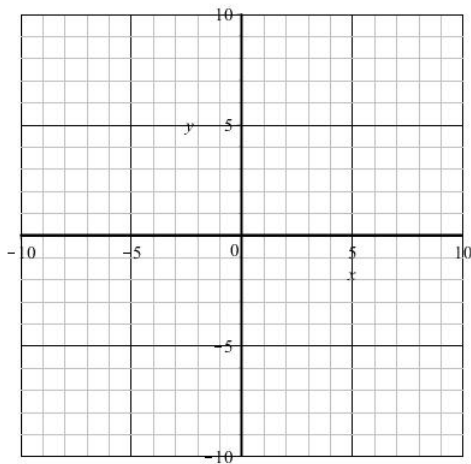
Ex: Find the formula for an exponential function $f(x) = ab^x$ that passes through the points $(-1, \frac{7}{2})$ and $(3, 56)$.

■ We can also shift and reflect graphs of $f(x) = b^x$.

Ex: Sketch. Find domain and range. Give any asymptotes. Then find the end behavior.

(a) $f(x) = 2^x + 2$

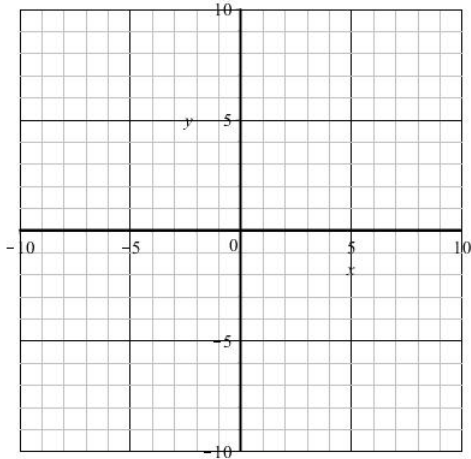
(b) $g(x) = -2^x$



- $e \approx 2.71812818284\dots$

Ex: Sketch $f(x) = e^x$.

Then write a function that would shift $f(x)$ 3 units to the left. Graph.



- Compound interest Formula: If P dollars are deposited in an account earning interest at an annual rate r , compounded n times each year, the amount A in the account after t years is given by $A = P \left(1 + \frac{r}{n}\right)^{nt}$

Ex: You want to save up enough money to buy a herd of llamas. It's a big herd so you need \$10,000. If you deposit \$7800 into an account paying 6.2% interest compounded monthly, will you have enough money to buy the herd in 4 years?

- Radioactive decay: The atomic structure of a radioactive material changes as the material emits radiation. The _____ of such a material is the time it takes for half of the sample to decompose.

Ex: Suppose we have 100 grams of substance X, which has a half-life of 10 years. Suppose further that substance X is safe at levels of 1 gram or less. How long will it take for substance to decay to a safe level?

- A little chemistry review: Look at this snapshot of part of the Periodic Table of the Elements:

5 B Boron 10.811	6 C Carbon 12.0107	7 N Nitrogen 14.0064
13 Al Aluminium 26.9815386	14 Si Silicon 28.0855	15 P Phosphorus 30.973762
16 S Sulfur 32.06	17 Cl Chlorine 35.45	18 Ar Argon 39.948

Recall:

- Atomic number gives the number of protons.
- Isotopes are atoms of the same element with different numbers of neutrons.
- Atomic mass is a weighted average of the protons and neutrons. This is not a whole number because of the different isotopes that exist.
- The amount A of a radioactive material at time t is given by $A = A_0 \cdot 2^{-\frac{t}{h}}$ where A_0 is the initial amount and h is the half-life.

Ex: The half life of radium is approximately 1600 years. How much of a 14 gram sample will remain after 1000 years?

88	2
Ra	18
Radium	32
(226)	18
	8
	2

Ex: A scientist begins with 100 milligrams of a radioactive substance that decays exponentially. After 36 hours, 50 mg of the substance remains. How many milligrams will remain after 54 hours? (Round your answer to two decimal places.)