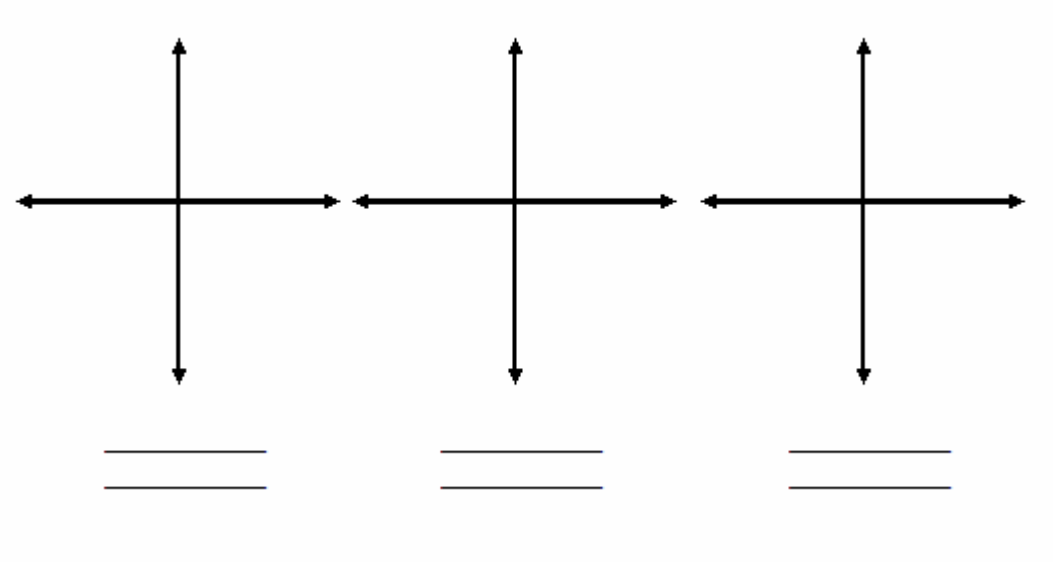
Chapter 1: Functions and Models

Section 1.5 – Exponential Functions

- Exponential function: _____.
  - ____ is called _____, and ____ is the _____.
  - Domain is _____, and range is _____ (unless _____). If _____, then the range is _____.

  Note: _____ (note: _____).



- Assume *a* and *b* are positive numbers and *x* and *y* are any real numbers. Then,
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- Example:

- Example: Does $x^a + x^b = x^{a+b}$?

- The most common choice for *a* is ____, which is _____

  Important features:
  -
  -
  -
  -

- Example: Suppose I tell you that I will give you \$300 after 6 days or 3^{n-1} dollars each day for 6 days, where n represents the number of days passed. Which would you prefer? Why?

Section 1.6 – Inverse Functions and Logarithms

- **Definition:** A function f is called one-to-one if _____; that is_____.
  - A function is one-to-one if and only if _____.
- _____ ↔ _____ ↔_____.
- Example: Is $f(x) = x^2$ 1-1?

  Two ways to check: _____
  - _____:

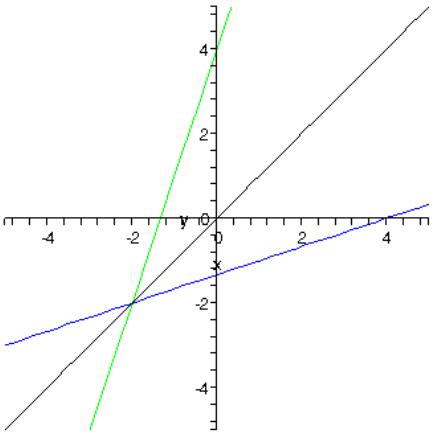
  - _____:

- Example: Is $f(x) = 5x + 3$ one-to-one?

- Inverse Function: Assume f is 1-1 with domain A and range B. Then f^{-1} has domain B and range A and $f^{-1}(y) = x$ ↔ $f(x) = y$ for any $y \in$ B.
- Note: $f^{-1}(f(x)) = x$ for all x in A and $f(f^{-1}(x)) = x$ for all x in B.
- Steps for finding a function's inverse:
  1. Write $y = f(x)$.
  2. Solve for x in terms of y (if possible).
  3. Express f^{-1} as a function of x by interchanging x and y, which gives the following: $y = f^{-1}(x)$.
- Example: Find the inverse of $f(x) = 3x + 4$.

- The graphs of a function and its inverse are _____.

- Prior Example: Graphs of f and f^{-1}:



- Example: Let $f(x) = 6x + 4$. Find $f^{-1}(16)$ without finding a formula for f^{-1}.

- Logarithms: The logarithmic function with base a is _____.
  Notation: _____ ↔ _____.

  What is the domain of the log function? Why?

  What is the range of the log function?

  What is the graph of the log function?

  Recall the graph of a^x.
  Important features:
  1. It passes through _____ since_____.
  2. _____ > 0.

- Properties/Laws of Logarithms
  1.
  2.
  If x and y are > 0, then
  3.
  4.
  5.

- The inverse of $y = e^x$ is _____.

- What is $\ln(e^x)$ and $e^{\ln x}$?

- Important property - **Change of base formula**: For any $a > 0$ ($a \neq 1$), _____.

- Examples: Solve.
  1. $\log_3 27$ = _____.
  2. $\log_{64} 8$ = _____.
  3. $\log_7 7^2$ = _____.
  4. $e^{(\ln 4 + \ln 7)}$ = _____.

Section 1.7 – Parametric Curves

- Suppose x and y are functions of a third variable t (called a _____). Then, $x = f(t)$ and $y = g(t)$ are _____. The point (x, y) = _____ varies as ___ varies and traces out a curve C (called the _____) in the coordinate plane.

  Note: The parametric curve does not have to_____.

  Note: A parametric curve will generally have an _____ point and _____ point. If _____, then _____ is the _____ point, and _____ is the _____ point.

- Example: You are given the following: $x = 4 \cos t$ and $y = 5 \sin t$ for $-\pi/2 \le t \le \pi/2$. Eliminate the parameter to find a Cartesian equation of the curve.

- Example: Given $x = e^t$ and $y = e^{-t}$. Eliminate the parameter to find a Cartesian equation of the curve.

- Example: Sketch the curve with parametric equation $x = \sin t, y = \sin^2 t$.