1.2 Day 2

48. odd

54. (1,1) -> (-1,-1) odd

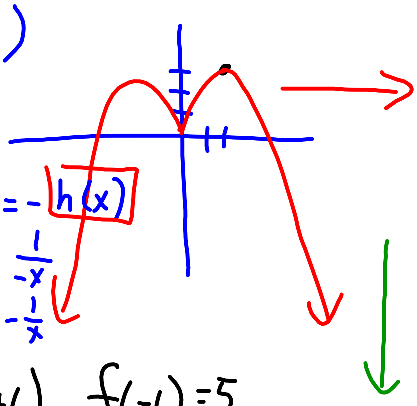
60. vert: none $h(x) = \boxed{\frac{1}{x}}$
    horiz: y=0

81)

$h(-x) = -\boxed{h(x)}$

$h(-x) = \frac{1}{-x}$

$= -\frac{1}{x}$



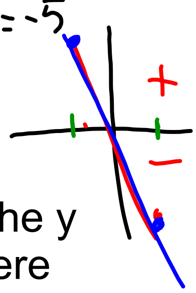
66. vert: none
    horiz: none
oblique: $\lim_{x \to \infty} = \infty \quad \lim_{x \to -\infty} = -\infty$

72. True

84)

$f(-1) = 5$

$f(1) = -5$



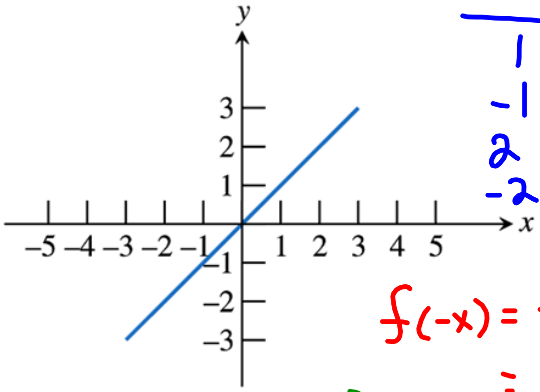
84. since the function is continuous and the y values switch from positive to negative there must be a zero between x=-1 and x=1. (intermediate value thm)

Section 1.3 Day 1

Twelve Basic Functions

- Students will be able to recognize graphs of twelve basic functions
- Students will be able to determine the domains of functions related to the twelve basic functions
- Students will be able to combine the twelve basic functions in various ways to create new functions

The Identity Function



$f(x) = x$

x	y
1	1
-1	-1
2	2
-2	-2

$f(-x) = -\boxed{f(x)}$

$= -x$

- Domain

  $(-\infty, \infty)$

- Range

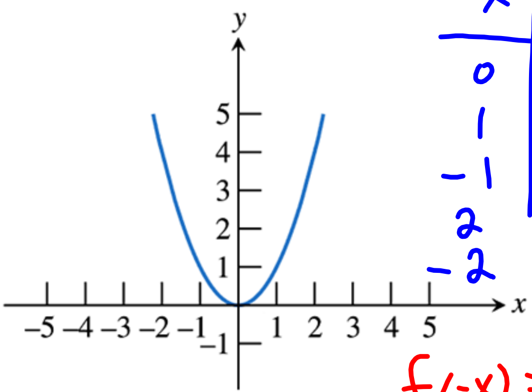
  $(-\infty, \infty)$

- Symmetry

  odd

Fun Fact: This is the $\boxed{\text{only}}$ function thats acts on every real number by leaving it alone.

The Squaring Function



$f(x) = x^2$

x	y
0	0
1	1
-1	1
2	2
-2	2

$f(-x) = f(x)$

$= (-x)^2$

$= x^2$

- Domain

  $(-\infty, \infty)$

- Range

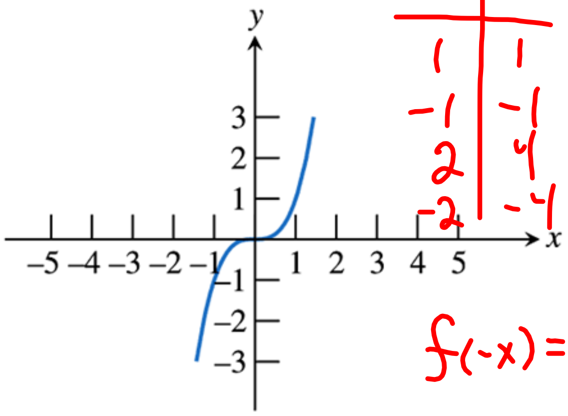
  $[0, \infty)$

- Symmetry

  EVEN /

Fun Fact: The graph of this function, called a parabola, has a reflection property that is useful in making flashlights and satellite dishes.

The Cubing Function



$f(x) = x^3$

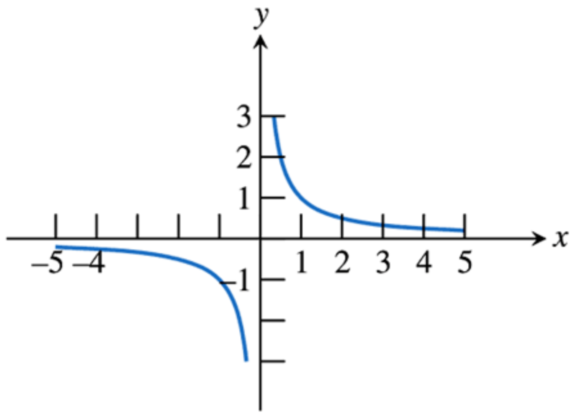
x	y
1	1
-1	-1
2	4
-2	-4

$f(-x) = -f(x)$
$= (-x)^3$
$= -x \cdot -x \cdot -x$
$= -x^3$

- Domain
  $(-\infty, \infty)$
- Range
  $(-\infty, \infty)$
- Symmetry
  Odd

Fun Fact: The origin is called a "point of inflection" for this curve because the graph changes curvature at this point.

The Reciprocal Function

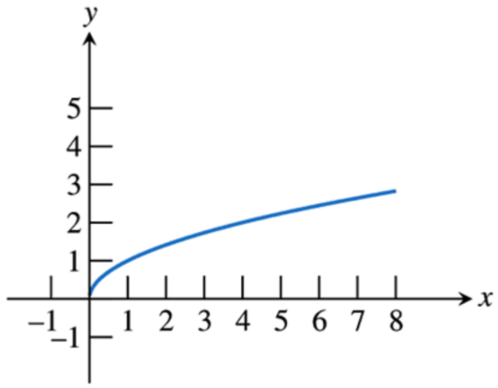


$f(x) = \frac{1}{x}$

- Domain
  $(-\infty, 0) \cup (0, \infty)$
- Range
  $(-\infty, 0) \cup (0, \infty)$
- Symmetry
  Odd

Fun Fact: This curve, called a hyperbola, also has a reflection property that is useful in satellite dishes.

The Square Root Function



$f(x) = \sqrt{x}$

- Domain

$[0, \infty)$

- Range

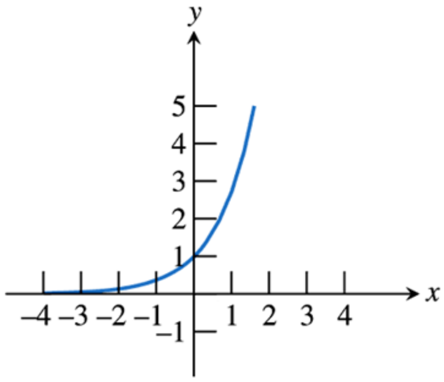
$[0, \infty)$

- Symmetry

NONE

Fun Fact: Put any positive number into your calculator. Take the square root. Then take the square root again. Then take the square root again, and so on. Eventually you will always get 1.

The Exponential Function



$f(x) = e^x$

- Domain

$(-\infty, \infty)$

- Range

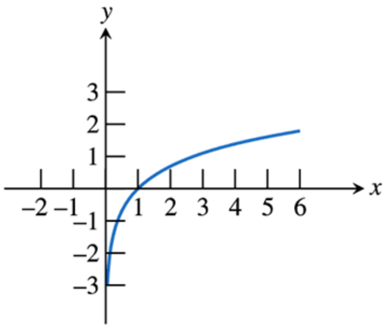
$(0, \infty)$

- Symmetry

NONE

Fun Fact: The number *e* is an irrational number (like π) pi that shows up in a variety of applications. The symbol e ee and π were both brought into popular use by the great Swiss mathematician Leonhard Euler (1707-1783) Oiler

The Natural Logarithm Function



$f(x) = \ln x$

- Domain

$(0,\infty)$

- Range

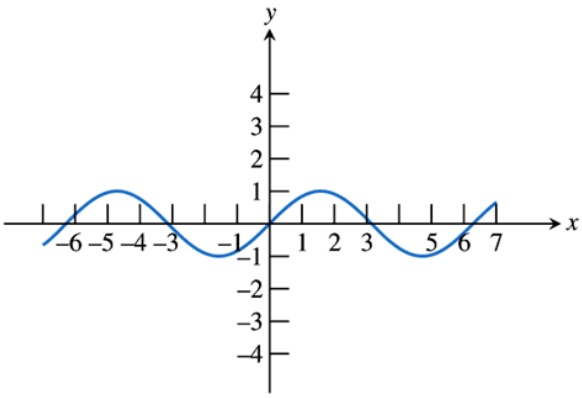
$(-\infty,\infty)$

- Symmetry

NONE

Fun Fact: This function increases very slowly. If the x-axis & y-axis were both scaled with unit lengths of one inch, you would have to travel more than two and a half miles along the curve just to get a foot above the x-axis.

The Sine Function



$f(x) = \sin x$

- Domain

$(-\infty,\infty)$

- Range

$[-1,1]$

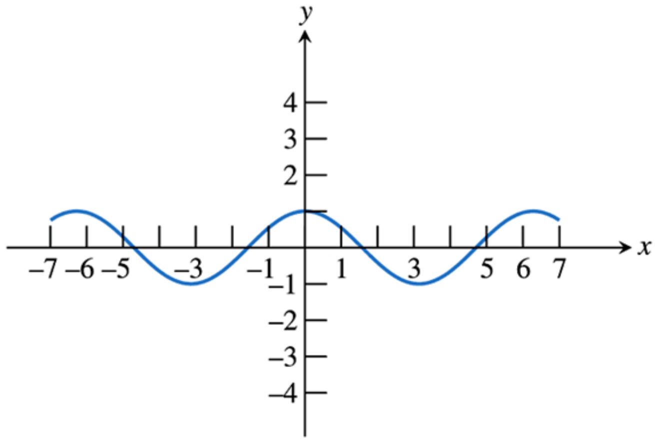
oscillating function

- Symmetry

Odd

Fun Fact: This function and the sinus cavities in your head derive their names from a common root: the Latin word for "bay". This is due to a 12th century mistake made by Robert of Chester, who translated a word incorrectly from an Arabic manuscript.

The Cosine Function



$f(x) = \cos x$

- Domain

$(-\infty, \infty)$

- Range

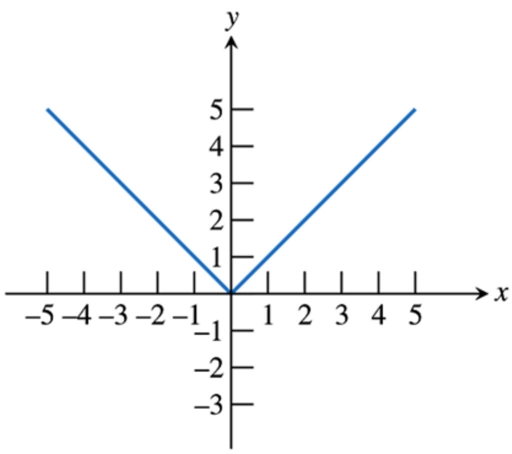
$[-1, 1]$

- Symmetry

EVEN

Fun Fact: The local extrema of the cosine function occure exactly at the zeros of the sine function, and vice versa.

The Absolute Value Function



$f(x) = |x| = \text{abs}(x)$

- Domain

$(-\infty, \infty)$

- Range

$[0, \infty)$

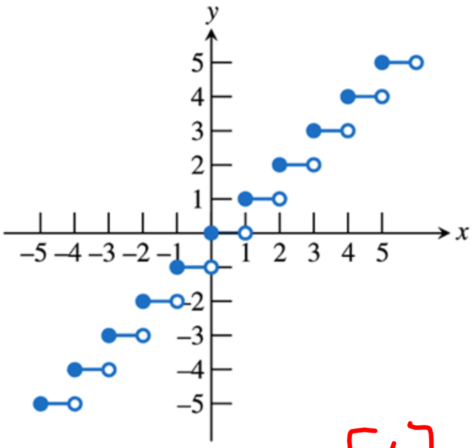
- Symmetry

EVEN

Fun Fact: This function has an abrupt change of direction (a "corner") at the origin, while our other functions are all "smooth" on their domain.

The Greatest Integer Function

Step Function



$f(x) = \text{int}(x)$ $[x]$

- Domain

  $(-\infty, \infty)$

- Range

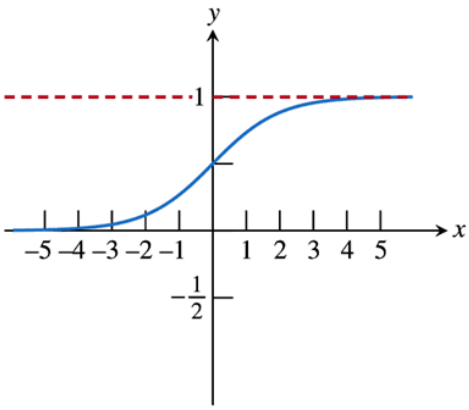
  INTEGERS

- Symmetry

  NONE

Fun Fact: This function has jump discontinuity at every integer value of x. Similar-looking functions are called *step functions*.

The Logistic Function



$$f(x) = \frac{1}{1 + e^{-x}}$$

- Domain

  $(-\infty, \infty)$

- Range

  $(0, 1)$

- Symmetry

  NONE

Fun Fact: There are two horizontal asymptotes, the x-axis and the line y = 1. This function provides a model for many applications in biology and business.

Looking for Domains

a. Nine of the functions have domain the set of all real numbers. Which three do not?

$y = \frac{1}{x}$ $\quad y = \sqrt{x}$ $\quad y = \ln x$

b. One of the functions has domain the set of all reals except 0. Which function is it, and why isn't zero in its domain?

$y = \frac{1}{x}$ $\quad \frac{1}{0}$ undef

c. Which two functions have no negative numbers in their domains? Of these two, which one is defined at zero?

$y = \sqrt{x}$ $\quad y = \ln x$

def @ 0

Looking for Continuity

Only two of twelve functions have points of discontinuity. Are these points in the domain of the function?

$y = \frac{1}{x}$ $\quad y = \text{int}(x)$

Looking for Boundedness

Only three of the twelve basic functions are bounded (above and below). Which three?

Looking for Symmetry

Three of the twelve basic functions are even. Which are they?

$y = x^2$ $y = \cos x$ $y = |x|$

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