Section 1.1 Lines

DEFINITION Increments

If a particle moves from the point (x_1, y_1) to the point (x_2, y_2), the **increments** in its coordinates are

$$\Delta x = x_2 - x_1 \quad \text{and} \quad \Delta y = y_2 - y_1$$

Δx means "delta x" change in x

Δy means "delta y" change in y

DEFINITION Slope

Let $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$ be points on a nonvertical line, L. The **slope** of L is

$$m = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}.$$

Parallel & Perpendicular Lines:

How are the slopes related?

$\parallel$ Parallel- parallel lines have the same slope.

$\perp$ Perpendicular- perp. lines have negative reciprocal slopes.

$$y = \frac{2}{3}x + 5$$

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Point-Slope Equation: $y - y_1 = m(x - x_1)$

The equation $y=m(x-x_1)+y_1$ is the point-slope equation of the line through the point (x_1,y_1) with slope m.

Slope-Intercept Equation:

The equation $y=mx+b$ is the slope-intercept equation of the line with slope m and y-intercept b.

General Linear Equation:

The equation $Ax+By=C$ ($A\neq 0$ and $B\neq 0$) is a general linear equation in x and y.

x-intercept: $y=0$

$Ax + B\cdot 0 = C$

$Ax = C$

$x = \frac{C}{A}$

$\left(\frac{C}{A}, 0\right)$

y-intercept: $x=0$

$A\cdot 0 + By = C$

$y = \frac{C}{B}$

$\left(0, \frac{C}{B}\right)$

slope: $Ax+By=C$

$By = -Ax + C$

$y = \frac{-A}{B}x + \frac{C}{B}$

slope: $-\frac{A}{B}$

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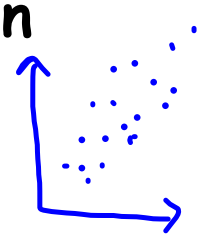
Linear Regression

Scatter Plot-



Regression Analysis-the process of finding a curve to fit data (steps are on pg.8)

Regression Curve-the curve that fits your data.

Work on the following (pgs.9-10):

PS 14) P(-1,1); m=-1

SI 18) m=-1; b=2

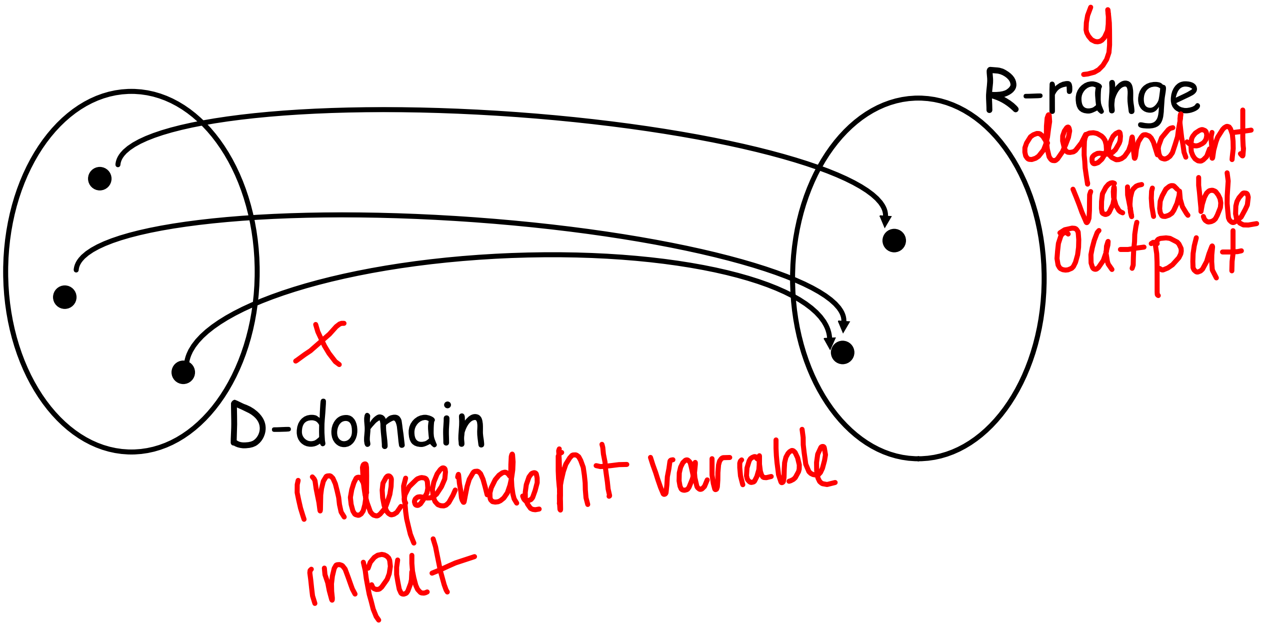
GLE 22) (1,1); (2,1)

32) P(-2,2), L: 2x+y=4

46)

Section 1.2 Functions & Their Graphs

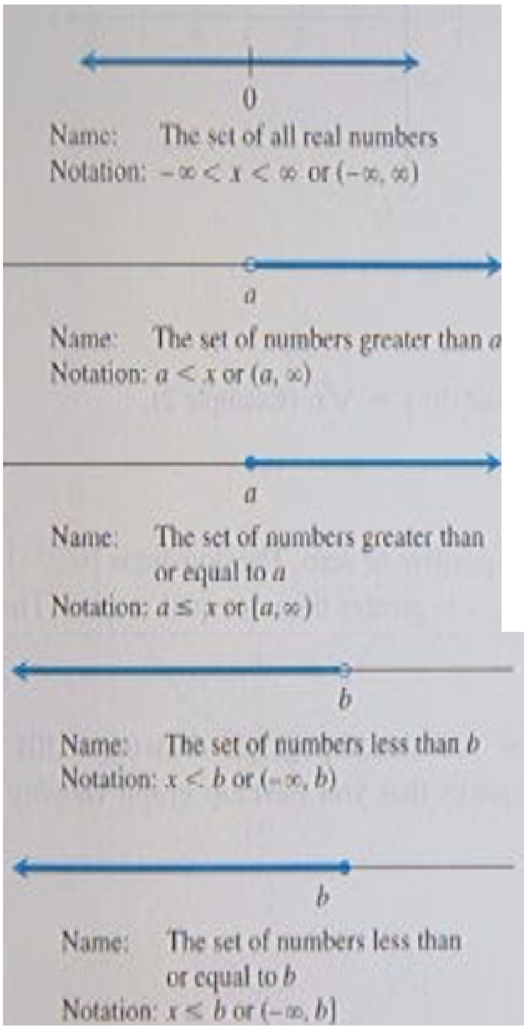
Function: A **function** from a set D to a set R is a rule that asigns a unique element in R to each element in D.



What else do we call domain and range?

When we define a function y=f(x) with a formula and the domain is not stated explicitly or restricted by context, the domain is assumed to be the largest set of x-values for which the formula gives real y-values--the so called **natural domain**.

*Look at pg.13



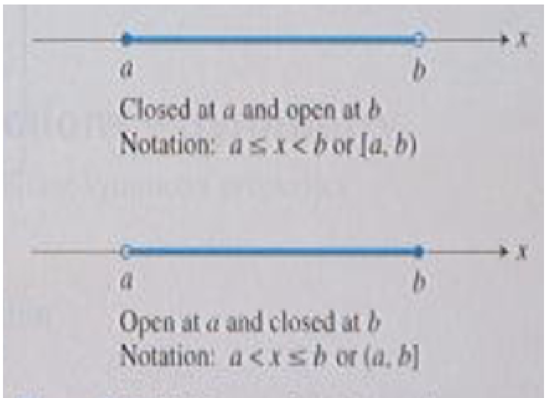


Figure 1.11 Half-open finite intervals.

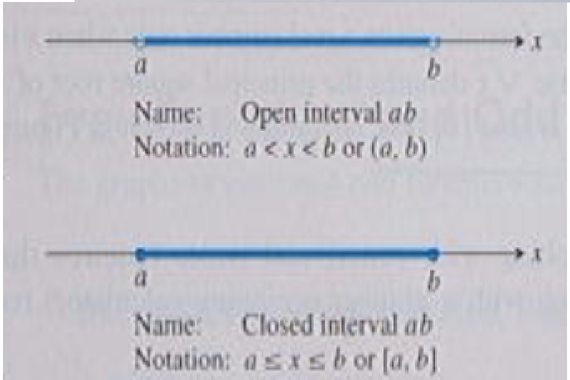


Figure 1.10 Open and closed finite intervals.

The endpoints of an interval make up the interval's **boundary** and are called **boundary points.** The remaining points make up the interval's **interior** and are called **interior points. Closed intervals** contain their boundary points. **Open intervals** contain no boundary points. Every point of an open interval is an interior point of the interval.

pg.14 has some helpful graph viewing skills

Even & Odd Functions

$f(x)=x^3$
$f(-x)=(-x)^3$
$f(-x)=-x^3$
$f(-x)=-f(x)$
ODD

DEFINITIONS **Even Function, Odd Function**

A function $y = f(x)$ is an

even function of x if $f(-x) = f(x)$,

odd function of x if $f(-x) = -f(x)$,

for every x in the function's domain.

$f(x)=x^2$
$f(-x)=(-x)^2$
$f(-x)=x^2$
$f(-x)=f(x)$
even

The graph of an even function is **symmetric about the y-axis.** Since $f(-x) = f(x)$, a point (x, y) lies on the graph if and only if the point $(-x, y)$ lies on the graph (Figure 1.15a).

The graph of an odd function is **symmetric about the origin.** Since $f(-x) = -f(x)$, a point (x, y) lies on the graph if and only if the point $(-x, -y)$ lies on the graph (Figure 1.15b).

$f(x)=x^3+x^2$
$f(-x)=(-x)^3+(-x)^2$
$f(-x)=-x^3+x^2$
neither

Absolute Value Function

The **absolute value function** $y = |x|$ is defined piecewise by the formula

$$|x| = \begin{cases} -x, & x < 0 \\ x, & x \geq 0. \end{cases}$$

The function is even, and its graph (Figure 1.19) is symmetric about the y-axis.

$f(x) = -|x-5| + 2$

reflect across x-axis

right 5

up 2

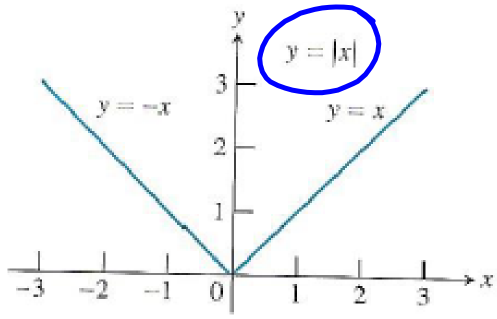


Figure 1.19 The absolute value function has domain $(-\infty, \infty)$ and range $[0, \infty)$.

Composite Functions

$(f \circ g)(x)$

Suppose that some of the outputs of a function g can be used as inputs of a function f. We can then link g and f to form a new function whose inputs x are inputs of g and whose outputs are the numbers $f(g(x))$, as in Figure 1.21. We say that the function $f(g(x))$ (read "f of g of x") is the **composite of g and f**. It is made by *composing* g and f in the order of first g, then f. The usual "stand-alone" notation for this composite is $f \circ g$, whi is read as "f of g." Thus, the value of $f \circ g$ at x is $(f \circ g)(x) = f(g(x))$.

52 $f(x) = x+1$

$g(x) = x-1$

a) $f(g(x))$

b) $g(f(x))$

c) $f(g(0))$

a) $f(x-1) =$

$x \cancel{-1+1} = x$

b) $g(x+1) = x + \cancel{1-1} = x$

c) $f(g(0)) = 0$

d) $g(f(0)) = 0$

Work on the following on page 19 with your table:

#8, 12, 14, 24, 26, 28, 32

Homework

1.1 pg.9-10 #1-37EOO
1.2 pg.19-20 #1-49EOO

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