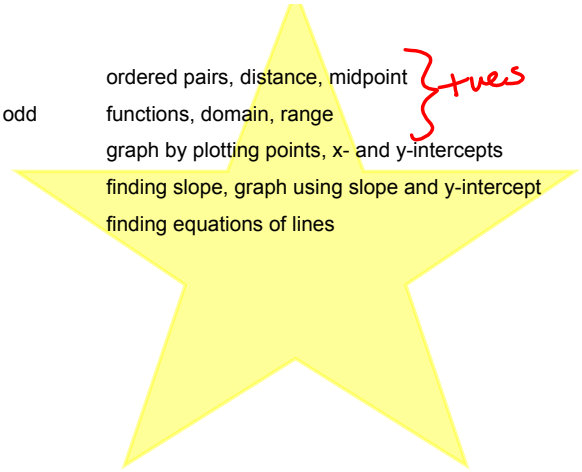
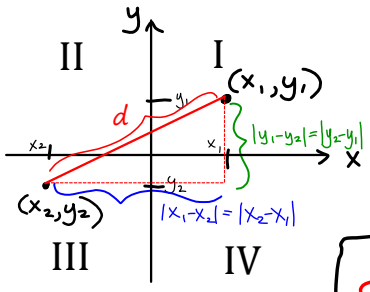
Chapter 3 Homework:

3.1 - #3-29 odd	ordered pairs, distance, midpoint
3.2 - #3-16 all, 21-43 odd, 49-87 odd	functions, domain, range
3.3 - #3-9 odd, 15-33 odd	graph by plotting points, x- and y-intercepts
3.4 - #3-19 odd, 29-41 odd	finding slope, graph using slope and y-intercept
3.5 - #3-49 odd	finding equations of lines



3.1 - The Rectangular Coordinate System

Plotting points, finding the distance between two points, and the midpoint between them



Pythagorean Theorem

$a^2+b^2=c^2$

$d^2=(x_2-x_1)^2+(y_2-y_1)^2$

$$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

Find the distance between (2, -3) and (-5, -1).

$x_1\ y_1 \qquad x_2\ y_2$

$$d=\sqrt{(-5-2)^2+(-1-(-3))^2}$$

$$(2-(-5))^2+(-3-(-1))^2$$

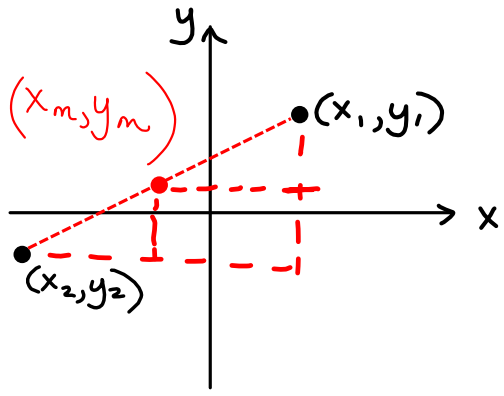
$$=\sqrt{(-7)^2+2^2} \qquad =\sqrt{49+4} \qquad =\boxed{\sqrt{53}}$$

$\sqrt{(a+b)^2}=a+b$

$\sqrt{a^2+b^2}\neq a+b$

$(a+b)^2=a^2+2ab+b^2$

Midpoint



$$(x_m,y_m)=\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$$

Find the midpoint between $(2,-3)$ & $(-1,5)$.

$x_1\ y_1 \quad x_2\ y_2$

$$(x_m, y_m) = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

$$= \left(\frac{2+(-1)}{2}, \frac{-3+5}{2}\right)$$

$$= \left(\frac{1}{2}, 1\right)$$

$(3,-1)$ is the midpoint between $(5,-5)$ and what other point?

$$(3,-1) = \left(\frac{5+x}{2}, \frac{-5+y}{2}\right)$$

$$3 = \frac{5+x}{2} \qquad -1 = \frac{-5+y}{2}$$

$$6 = 5+x \qquad -2 = -5+y$$

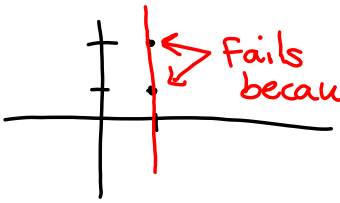
$$1 = x \qquad 3 = y$$

$(1,3)$

3.2 Introduction to Functions

relation - set of ordered pairs

function - relation in which no two ordered pairs have the same first coordinates but different second coordinates (must pass the vertical line test)



$\{(1,2),(3,4),(5,6),(6,1),(7,2)\}$

Is this relation a function?

yes

$\{(1,2),(3,4),(1,5),(2,4)\}$

function?

no - 1 maps to both 2 & 5

$\{(1,2),(2,2),(3,2),(4,2),(5,2)\}$

function? yes

$y = 3x^2 - 2x$ $(0,0)$, $(1,1)$, $(-1,5)$

x is the independent variable
(we can choose values to plug in)

y is the dependent variable
(y values are dependent on the x values we plug in)

$\Rightarrow y$ is a function of x

functional notation: $y = f(x)$

"f of x"

NOT f "times" x

Evaluating a Function

(x,y)

$(x, f(x))$

$f(x) = 3x^2 - 2x$

$f(2) = 3(2)^2 - 2(2) = 3(4) - 4 = 12 - 4 = \boxed{8}$

$f(-3) = 3(-3)^2 - 2(-3) = 3(9) + 6 = 27 + 6 = \boxed{33}$

$h(t) = 7 - 2t$

$h(-5) = 7 - 2(-5) = 7 + 10 = \boxed{17}$

$h(4) = 7 - 2(4) = 7 - 8 = \boxed{-1}$

$h(x) = \boxed{7 - 2x}$

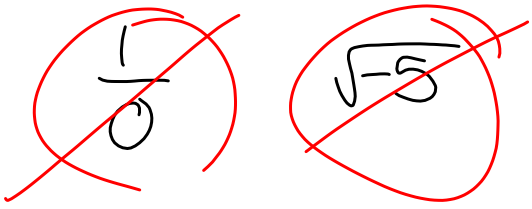
$h(x+4) = 7 - 2(x+4) = 7 - 2x - 8 = \boxed{-2x - 1}$

Domain & Range

Domain is the set of real numbers for which the function value is a real number (the set of numbers that "make sense" when you plug them into the function)

$f(x) = \frac{1}{x}$ $\quad x \neq 0$

* exclude values of variable that give us 0 in the denominator &
negative values under a radical



What values are not in the domain?

$f(x) = \frac{3}{x-4}$, $x \neq 4$

domain:

$\{x \mid x \neq 4\}$

$(-\infty, 4) \cup (4, \infty)$

$f(x) = \frac{x+3}{x-7}$, $x \neq 7$

$(-\infty, 7) \cup (7, \infty)$

$\{x \mid x < 7 \text{ or } x > 7\}$

$f(x) = \frac{2x^2}{(x-1)(x+5)}$, $x \neq 1, -5$

$(-\infty, -5) \cup (-5, 1) \cup (1, \infty)$

State the domain of the function.

$f(x) = \sqrt{x}$ $\{x \mid x \geq 0\} = [0, \infty)$

$f(x) = \sqrt{x+2}$ $x+2 \geq 0$, $x \geq -2$ $[-2, \infty)$

$f(x) = \sqrt{5-x}$ $5-x \geq 0$, $5 \geq x$, $x \leq 5$ $(-\infty, 5]$

Range : output of the domain

$\{(1,2),(3,4),(5,6),(7,8)\}$

domain: $\{1,3,5,7\}$ (x-coord's)

range: $\{2,4,6,8\}$ (y-coord's)

$f(x) = \frac{3x-2}{x+4}$

domain: $\{-1,-2,1\}$

range:

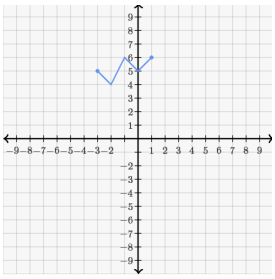
$\{-4, \frac{-5}{3}, \frac{1}{5}\}$

$f(-1) = \frac{3(-1)-2}{-1+4} = \frac{-5}{3}$

$f(-2) = \frac{3(-2)-2}{-2+4} = \frac{-6-2}{2} = \frac{-8}{2} = -4$

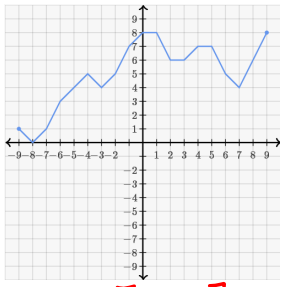
$f(1) = \frac{3(1)-2}{1+4} = \frac{1}{5}$

State the domain and range of the function graphed in blue.



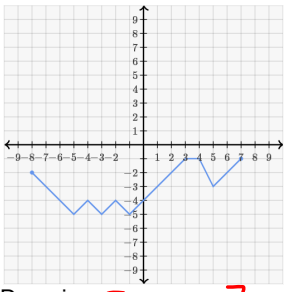
Domain: $[-3,1]$

Range: $[4,6]$



Domain: $[-9,9]$

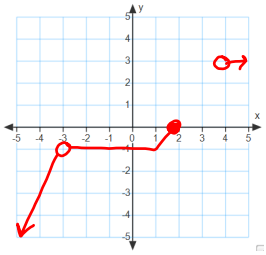
Range: $[0,8]$



Domain: $[-8,7]$

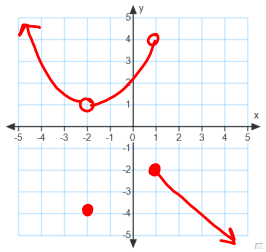
Range: $[-5,-1]$

State the domain and range of the function.



Domain: $(-\infty,-3)\cup(-3,2]\cup(4,\infty)$

Range: $(-\infty,0]\cup\{3\}$



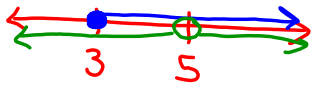
Domain: $(-\infty,\infty)=\mathbb{R}$

Range: $(-\infty,-2]\cup(1,\infty)$

$f(x) = \frac{\sqrt{x-3}}{x-5}$ What is the domain of f?

$x-5 \neq 0$ and $x-3 \geq 0$

$x \neq 5$ $\cap$ $x \geq 3$



$[3,5) \cup (5,\infty)$

$f(x) = \frac{x-5}{\sqrt{x-3}}$ What is the domain?

$x-3 \geq 0$ and $x-3 \neq 0$

$x-3 > 0$

$\{x \mid x > 3\}$

$(3,\infty)$

$$f(x)=\frac{\sqrt{5-x}}{(x+2)(x-6)}$$

$5-x\geq 0$ and $x+2\neq 0$ and $x-6\neq 0$

$5\geq x$ $\quad -x\geq -5$, $x\leq 5$ $\qquad x\neq -2 \qquad x\neq 6$

$x\leq 5$

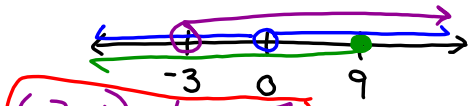
$(-\infty,-2)\cup(-2,5]$

$$f(x)=\frac{\sqrt{9-x}}{x\sqrt{x+3}}$$

$9-x\geq 0$ and $x\neq 0$ and $x+3>0$

$-x\geq -9$ $\qquad x>-3$

$x\leq 9$



$(-3,0)\cup(0,9]$

$\{x\mid -3<x<0 \text{ or } 0<x\leq 9\}$

$\{x\mid -3<x\leq 9 \text{ and } x\neq 0\}$