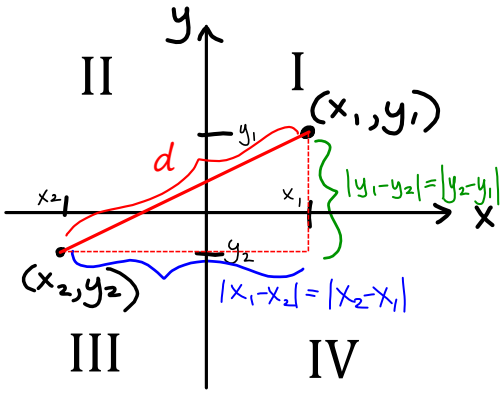
Chapter 3 Homework:

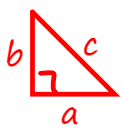
3.1 - #3-29 odd ←	ordered pairs, distance, midpoint
3.2 - #3-16 all, 21-43 odd, 49-87 odd ←	functions, domain, range
3.3 - #3-9 odd, 15-33 odd	graph by plotting points, x- and y-intercepts
3.4 - #3-19 odd, 29-41 odd	finding slope, graph using slope and y-intercept
3.5 - #3-49 odd	finding equations of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

$x_1, y_1 \quad x_2, y_2$

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

$$= \sqrt{(-7)^2 + 2^2}$$

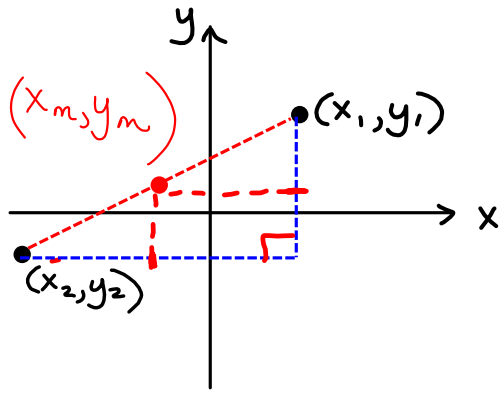
$$= \sqrt{49+4} = \boxed{\sqrt{53}}$$

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

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

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

Midpoint



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

"average" x- & y-values

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

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

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

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

$\boxed{(1,3)}$

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

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

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

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

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)

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

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

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

$h(t) = 7 - 2t$

$h(-5) = 7 - 2(-5) = 7 + 10 = 17$

$h(4) = 7 - 2(4) = 7 - 8 = -1$

$h(x) = 7 - 2x$

$h(x+4) = 7 - 2(x+4) = 7 - 2x - 8 = -2x - 1$

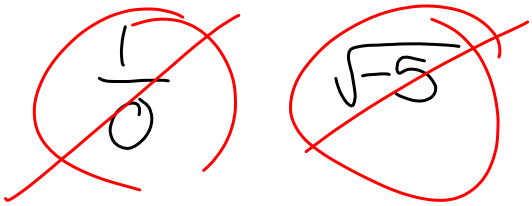
$h(\text{jack}) = 7 - 2(\text{jack})$

Domain & Range

Domain 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: $\{x \mid x \neq 4\}$; $(-\infty, 4) \cup (4, \infty)$

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

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

State the domain of the function.

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

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

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