→ $y = x^3$

origin $(-y) = (-x)^3$

$-1 \cdot -y = -x^3 \cdot -1$

$y = x^3$

$y = |x+2|$

$y = |0+2|$

$= |2|$

$= 2$

$0 = |x+2|$

$\frac{0}{-2} = \frac{x+2}{-2}$

$x = -2$

75) $(0,0)$ $(6,8)$

$\left(\frac{0+6}{2}, \frac{0+8}{2}\right)$

$(3,4)$

$\sqrt{(6-0)^2 + (8-0)^2}$

$\sqrt{36+64}$

$\sqrt{100}$

$d = 10$

$r = 5$

$r = 25$

$(x-3)^2 + (y-4)^2 = 25$

$1 = x+2$

$-1 = x+2$

Section 1.3

Linear Equation in Two Variables

Slope — m = slope

$y = mx + b$

graphing

$\frac{\text{rise}}{\text{run}}$

$\frac{\text{change in } y}{\text{change in } x}$ $\frac{\Delta y}{\Delta x}$

$\frac{y_2 - y_1}{x_2 - x_1}$

rate of change

positive ↗

negative ↘

$m = 0$ ↔ $y = b$

m is undefined (no slope) ↕ $x = a$

$y = mx + b$ — slope, y-intercept $(0, b)$

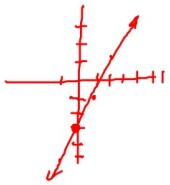
$y = 2x - 3$

$(0, -3)$

$m = 2$

$\frac{2}{1}$

$\frac{-2}{-1}$

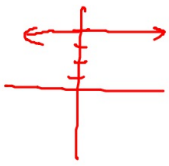


Graph $y = -3x + 1$

y-int: (0,1)

slope: -3

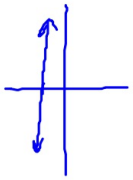
$y = 4$



(0,4)

$m = 0$

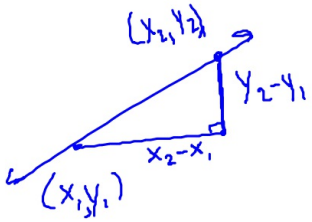
$x = -1$



no y-int

slope: undefined

Slope $= \frac{y_2 - y_1}{x_2 - x_1}$



$(-3, 1)$ $(4, -2)$

find the slope

$m = \frac{-2-1}{4-(-3)} = \boxed{\frac{-3}{7}}$

$(0,-1)$ $(3,-1)$

$m = \frac{-1-(-1)}{3-0} = \frac{0}{3} = 0$

$(0,6)$ $(0,-6)$

$m = \frac{-6-6}{0-0} = \frac{-12}{0}$ = undefined

Equation of a line

$y - y_1 = m(x - x_1)$ point-slope form

Given m, (x_1, y_1)

Write the equation of the line through $(-3,1)$ and $(4,-2)$

x_1, y_1

we found $m = \frac{-3}{7}$

$y - 1 = \frac{-3}{7}(x - (-3))$

$y - 1 = \frac{-3}{7}(x + 3)$ point-slope form

Change to slope-intercept form

$y - 1 = \frac{-3}{7}(x+3)$

$y - 1 = \frac{-3}{7}x - \frac{9}{7}$

$+1 \qquad +1$

$y = \frac{-3}{7}x - \frac{2}{7}$

Write the equation given the slope and a point

$m = 2$ $(3,-7)$

$y - (-7) = 2(x - 3)$

$y + 7 = 2(x - 3)$ point-slope

$y + 7 = 2x - 6$

$-7 \qquad -7$

$y = 2x - 13$ slope-int.

$m = 0$ $(1,1)$

$y - 1 = 0(x - 1)$ pt. slope

$0x - 0.1$

$y - 1 = 0$

$+1 \qquad +1$

$y = 1$ slope-intercept

slope undefined $(-3, 5)$

can't use formula

$x = -3$

*memorize

Parallel lines

$m_1 = m_2$ same slope

Perpendicular lines

$m_1 = -\frac{1}{m_2}$ opposite, reciprocal

or

$m_1 \cdot m_2 = -1$

Equations of Lines

general: (standard) $Ax+By=C$

vertical line $x=a$

horizontal line $y=b$

slope-intercept $y=mx+b$

point-slope $y-y_1=m(x-x_1)$

two-point $y-y_1=\frac{y_2-y_1}{x_2-x_1}(x-x_1)$

Find the slope-intercept form for the equation of a line that pass through the point $(-4,1)$ and is a) parallel to b) perpendicular to $5x-3y=8$

Slope

$5x-3y=8$

$-5x \quad -5x$

$\frac{-3y}{-3} = \frac{-5x}{-3} + \frac{8}{-3}$

$y=\frac{5}{3}x-\frac{8}{3}$

$m=\frac{5}{3}$

a) $\parallel m = \frac{5}{3}$

$y-1=\frac{5}{3}(x+4)$

$y-1=\frac{5}{3}x+\frac{20}{3}$

$+1 \quad +1$

$y=\frac{5}{3}x+\frac{23}{3}$

b) $\perp m = -\frac{3}{5}$

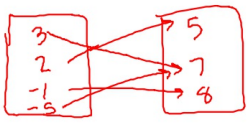
$y-1=-\frac{3}{5}(x+4)$

$y-1=-\frac{3}{5}x-\frac{12}{5}$

$+1 \quad +1$

$y=-\frac{3}{5}x-\frac{7}{5}$

Section 1.4 Functions



each x-value is paired up with a unique y-value

Domain: x-values

Range: y-values

x	y
2	11
2	10
3	8
4	5

Function? no

$x^2+y^2=25$

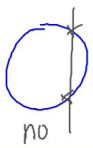
$-x^2 \quad -x^2$

$\sqrt{y^2}=\sqrt{-x^2+25}$

$y=\pm\sqrt{-x^2+25}$ not a function

Vertical line test

a vertical line can pass through at most one point on a function



Algebraic

$x^2+y=1$

$-x^2 \quad -x^2$

$y=-x^2+1$

yes

$-x+y^2=1$

$+x \quad +x$

$\sqrt{y^2}=\sqrt{x+1}$

$y=\pm\sqrt{x+1}$

no

Whenever you take the square root to solve an equation, you must consider the + and - solution

$f(x) = 10 - 3x^2$

Find each value

y when $x=2$: $f(2) = 10-3(2)^2 = 10-3(4) = 10-12 = \boxed{-2}$ $\quad (2,-2)$

y when $x=-4$: $f(-4) = 10-3(-4)^2 = 10-3(16) = 10-48 = \boxed{-38}$ $\quad (-4,-38)$

$f(b) = 10-3(b)^2 = \boxed{10-3b^2}$ $\quad (b, 10-3b^2)$

$f(x-1) = 10-3(x-1)^2$

$= 10-3(x-1)(x-1)$

$= 10-3(x^2-x-x+1)$

$= 10-3(x^2-2x+1)$

$= 10-3x^2+6x-3$

$= \boxed{-3x^2+6x+7}$ $\quad (x-1, -3x^2+6x+7)$

Piecewise Function (domain)

$$f(x) = \begin{cases} x^2+1, & x<0 \\ x-1, & x\geq 0 \end{cases}$$

$f(2) = (2)-1 = \boxed{1}$ $\quad (2,1)$

$f(0) = (0)-1 = \boxed{-1}$ $\quad (0,-1)$

$f(-1) = (-1)^2+1 = \boxed{2}$ $\quad (-1,2)$

$f(x) = 0$ Find values for which $f(x)=0$ (what x-value will make $y=0$) (x-intercept)

$f(x) = 2x+10$

$0 = 2x+10$

$-10 \quad -10$

$\frac{-10}{2} = \frac{2x}{2}$

$\boxed{-5 = x}$ $\quad (-5,0)$

$f(x) = x^2-16$

$0 = x^2-16$

$+16 \quad +16$

$\sqrt{16} = \sqrt{x^2}$

$\pm 4 = x$

$\boxed{x = \pm 4}$ $\quad (4,0)$ $(-4,0)$

p. 31: 11, 17, 23, 29, 37, 39, 45, 51, 53, 55, 63, 73, 77

p. 44: 5-13 odd, 21, 25, 27, 31, 33, 37, 39, 41, 45, 47, 51, 61, 77, 79