Chp. 1.2: Linear & Quadratic Functions

- Linear:
  - one variable equation has exponent of 1 (or 0)
    - slope-intercept: $y = mx + b$ (m: slope, b: y-intercept)
    - standard form: $ax + by = c$
    - ★ point-slope form: $y - b = m(x - a)$ (b: a specific y-value, a: a specific x-value)

Slope:

- describes the incline of a linear graph

Ex: $m = 3/2$: go up 3, over 2 →

Ex: graph $2x + 3y = 5$

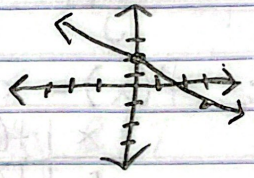
$2x + 3y = 5$

$-2x$

$3y = -2x + 5$

$\div 3$

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



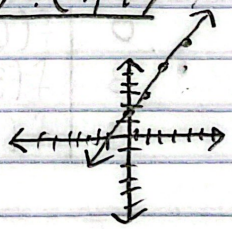
Ex: graph a line that goes through (1,3) & (4,7)

★ $m = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{7-3}{4-1} = \frac{4}{3}$

$y - b = m(x - a)$ (1, 3) (a, b)

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

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



- Quadratic:
  - $y = ax^2 + bx + c$ (highest exponent is the degree)
  - parabola: ∪ = $a > 0$ ∩ = $a < 0$

↓

Solving a Quadratic:

- $0 = ax^2 + bx + c$
- QF: $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ or factor $0 = a(x-h)(x-k)$ $x=h, x=k$
- Ex: $0 = \underset{a}{2}x^2 + \underset{b}{3}x \underset{c}{-4}$

$$x = \frac{-3 \pm \sqrt{3^2-4(2)(-4)}}{2(2)} = \frac{-3 \pm \sqrt{9+32}}{4} = \frac{-3 \pm \sqrt{41}}{4} = \boxed{\frac{-3}{4} + \frac{\sqrt{41}}{4}}$$

Intercepts:

- x-intercept occurs if $y=0$
- y-intercept occurs if $x=0$

Domain:

- a list or set of all possible inputs
  - there are 3 domain restrictions:
    1. $\sqrt{-\#}$
    2. $\frac{\#}{0}$
    3. $\log_a(-\#)$

Ex: $f(x) = 4x^{20} + 3x - 2$

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domain: $x \in \mathbb{R}$ or $x \in (-\infty, \infty)$

Ex: $g(x) = 3\sqrt{9-x}$

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$\sqrt{9-x}$ can't have a negative!

so, $9-x \geq 0$

$= 9 \geq x$

domain: $x \leq 9$ or $x \in (-\infty, 9]$

Ex: $h(x) = \frac{3x+7}{\sqrt{x+2}}$

↓

$\sqrt{x+2} \neq 0$ & $x+2 \leq 0$

$x+2 \neq 0$ $\quad x \geq -2$

$x \neq -2$

$x > -2$

→ domain: $x > -2$ or $x \in (-2, \infty$