1.3 Latent functions and Constructions

Types of functions

Polynomials

$y = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$

"the sum of terms made by coefficients and x to a natural exponent"

Ex: $y = x^2$, $y = 3x + 7$, $y = 5x^{12} + 19^{174} - 2$

Rational Function

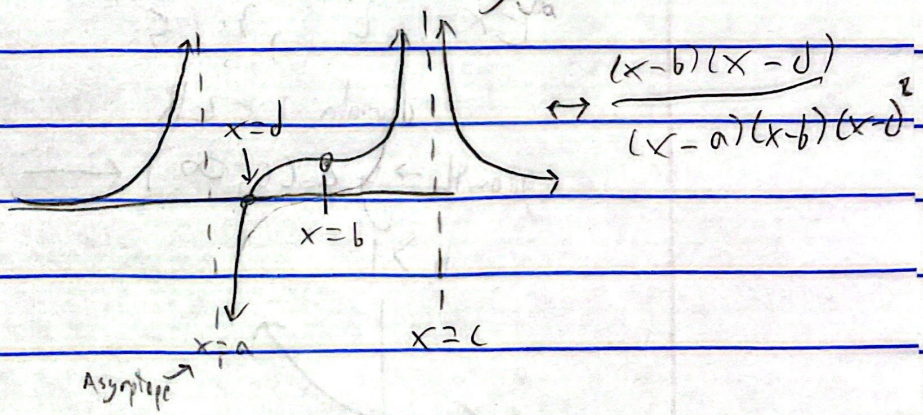
$R(x) = \frac{P(x)}{Q(x)}$ where P, Q are polynomials

RF Domain - $x \in \{x : Q(x) \neq 0\}$ Range: usually $y \in \mathbb{R}$ but it varies

Roots = $\frac{0}{\#}$

Asymptotes = $\frac{\#}{0}$

holes = $\frac{0}{0}$



Algebraic (can have fractional exponents)

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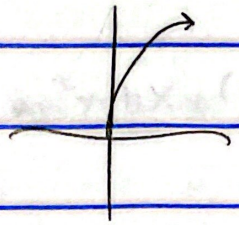
$x = \frac{\text{odd}}{\text{even}}$

x :

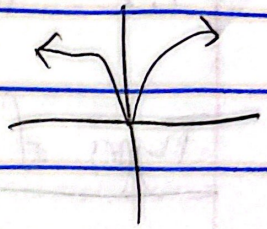


$x \in [0, \infty)$

$y \in [0, \infty)$

$x \frac{\text{even}}{\text{odd}}$

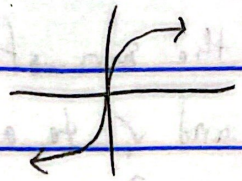
x :



$x \in \mathbb{R}$

$y \in [0, \infty)$

$x = \frac{\text{odd}}{\text{odd}}$



$x \in \mathbb{R}$

$y \in \mathbb{R}$

Exponential:

$y = b^x \Rightarrow y = a \cdot b^x$ ← var. exponent

← base

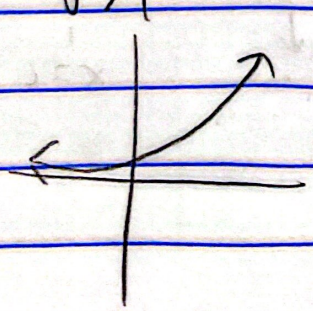
↖ coef.

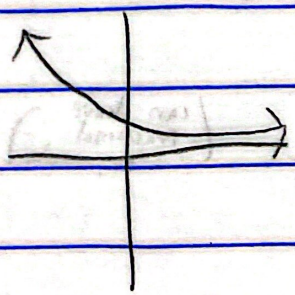
EX: 2^x, $3 \cdot 1.5^{2x}$

domain: $x \in \mathbb{R}$

growth → $y \in (0, \infty)$ ← decay $0 < b < 1$

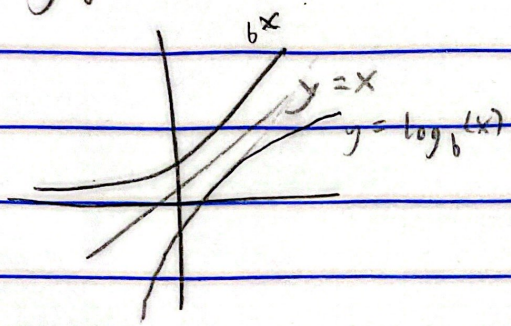
$b > 1$





Logarithmic

$y = \log_b(x)$; $b > 0$



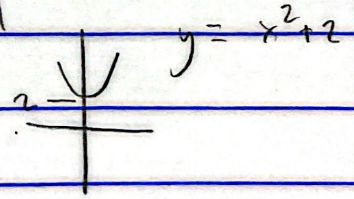
Constructions

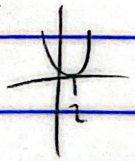
Translating: moving side to side or up down

$y = f(x-a)$

moves right a units

$y = (x-2)^2$



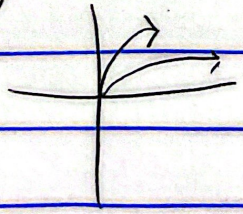


Scaling: changing size

horizontal: "happens faster"

$y = f(ax)$

$y = \sqrt{2x}$



vertical: make tall or short

$y = a \cdot f(x)$

$y = 2\sqrt{x}$