

CH 1: Functions as models

1.2 Mathematical Models: A catalog of essential functions

This section studies the common function we will use in this class.

1. linear function: $f(x) = ax + b$ is a function whose graph is a straight line
2. polynomial $p(x) = a_nx^n + a_{n-1}x^{n-1} + \dots + a_3x^3 + a_2x^2 + a_1x + a_0$, where $a_n, a_{n-1}, \dots, a_1, a_0$ are the coefficients (generally real numbers). Note that the powers of x are always nonnegative whole numbers. If $a_n \neq 0$, we say that the polynomial has degree n .
3. power function: $f(x) = x^a$, where a is the constant (here a doesn't have to be a whole number as it was above). So the power is constant and the variable is raised to the constant power. If the power is a fraction, then the function is a root function
4. rational function: $f(x) = \frac{P(x)}{Q(x)}$, where $P(x), Q(x)$ are polynomials, and $Q(x) \neq 0$.
5. algebraic function: $f(x)$ is some algebraic expression obtained from addition, subtraction, multiplication, quotient and root of polynomials.
6. trig function: $\sin x, \cos x, \tan x$ and so on
7. exponential functions: $f(x) = a^x$, where a is a constant. Note the difference between exponential ($f(x) = x^2$) and exponential function ($f(x) = 2^x$)
8. logarithmic functions: $f(x) = \log_a x$, where $a > 0$ is a constant. They are the inverse functions of exponential functions
9. transcendental function: they are nonalgebraic functions (i.e. functions obtained from combinations of other than polynomials and trig functions, exponential functions, logarithmic functions and any of them even with polynomials)