Polynomial functions (sec. 11.2)

Thursday, December 3, 2020 4:41 PM

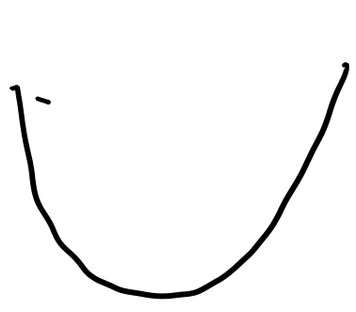
A polynomial function is a sum of power functions whose exponents are nonnegative integers

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

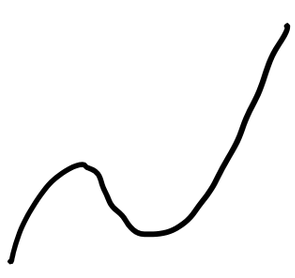
where n is positive integer called the **degree** of the polynomial and $a_n \neq 0$.

- Each power function $a_i x^i$ in the sum above is called a term
- All the constants $a_n, a_{n-1}, \dots, a_0$ are called coefficients
- The term a_0 is called the constant term
  a_n is the leading coefficient
  $a_n x^n$ is the leading term

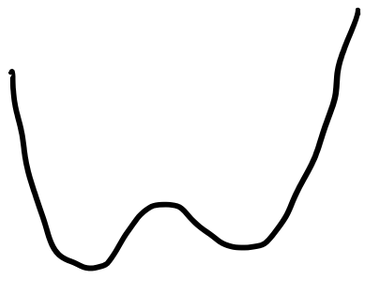
Examples



quadratic (n=2)



Cubic (n=3)



quartic (n=4)

Is the following a polynomial.

(1) $y = 3x^4 + 2x^2 + x^{-1}$ No x^{-1} ← cannot have negative powers

Long-run behavior for polynomials

As $x \to \infty$ and as $x \to -\infty$ then $p(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$ looks like $y = a_n x^n$ (leading term, power function).

$$\lim_{x \to \infty} p(x) = \lim_{x \to \infty} a_n x^n$$

$$\lim_{x \to -\infty} p(x) = \lim_{x \to -\infty} a_n x^n$$