

$f(x)$



Functions

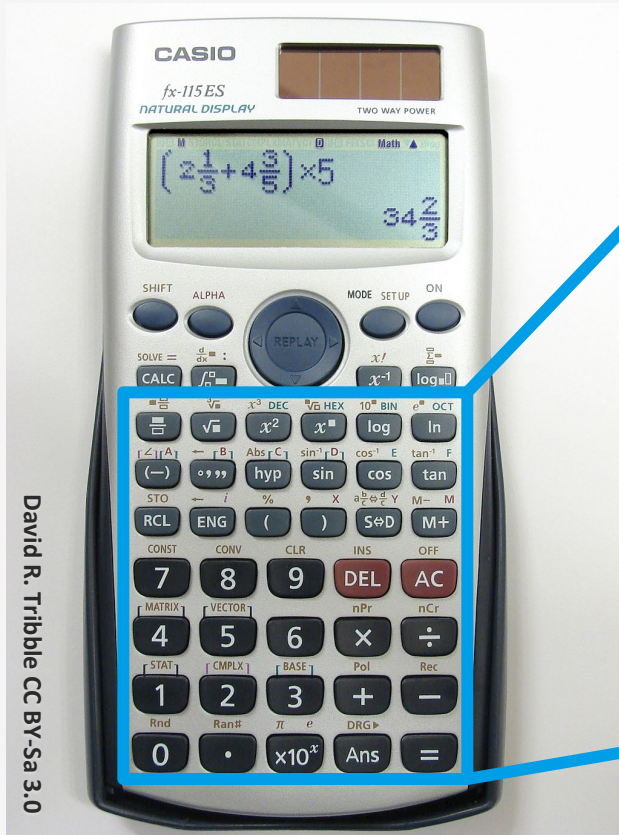
What is a polynomial?

Bart van den Dries

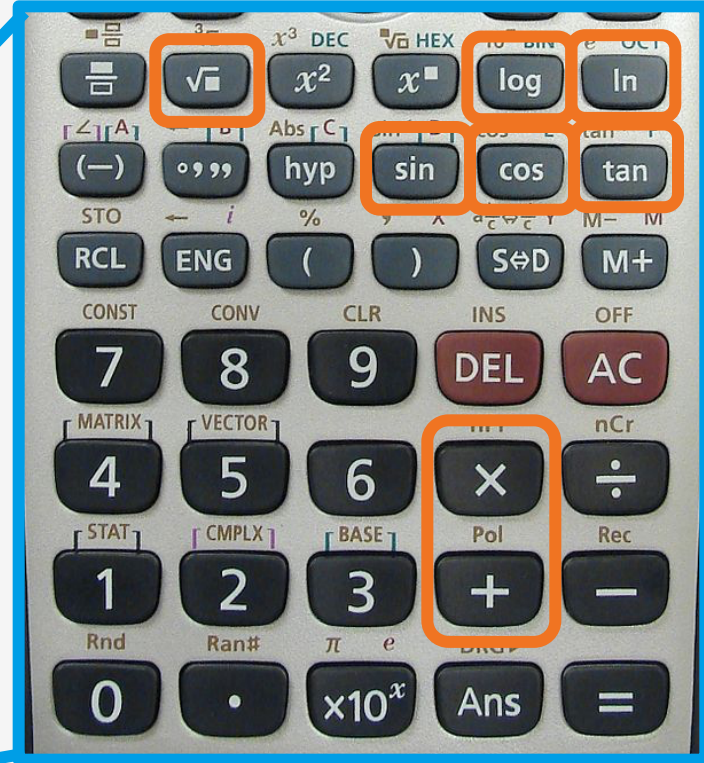


photo: Jorrit Lousberg

The calculator



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Polynomials

$p(x) =$

x

Polynomial

Polynomial function:

Constructed from:

- variable x
- numbers
- addition
- multiplication

Polynomials

$$p(x) = (x^5 + -1) \cdot (2x + 3) + \frac{1}{2}x$$

$$= \underline{\hspace{2cm}} \underline{\hspace{2cm}} \underline{\hspace{2cm}} + \frac{1}{2}x$$

$$= 2x^6 + 3x^5 - \frac{3}{2}x - 3$$

**Standard
form**

Simplify:

- Expand brackets
- Gather terms
- Order terms

Standard form

Standard form in general:

$$a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x + a_0$$

Diagram illustrating the standard form of a polynomial. The terms are $a_n x^n$, $a_{n-1} x^{n-1}$, \dots , $a_2 x^2$, $a_1 x$, and a_0 . The coefficients a_n , a_{n-1} , a_2 , a_1 , and a_0 are circled in orange. An arrow points from the text "Degree is n " to the circled a_n . Another arrow points from the text "Coefficients" to the circled a_2 , a_1 , and a_0 .

Example:

$$(x^3 - 4)^2 - x^6 + 2x^5 = 2x^5 - 8x^3 - 16$$

Diagram illustrating the example polynomial in standard form. The term $2x^5$ is circled in orange.

Simplify:

- Expand brackets
- Gather terms
- Order terms

The degree

$$p(x) = 2x^3 + 8x^2 - 13x$$

x	$2x^3$	$8x^2$	$-13x$	$p(x)$
1	2	8	-13	-3


$$p(x) \sim 2x^3$$

The degree

$$p(x) = 2x^3 + 8x^2 - 13x$$

x	$2x^3$	$8x^2$	$-13x$	$p(x)$
-1	-2	8	13	19
-10	-2,000	800	130	-1,070
-100	-2,000,000	80,000	1,300	-1,918,700
-1,000	-2,000,000,000	8,000,000	13,000	-1,991,987,000


$$p(x) \sim 2x^3$$

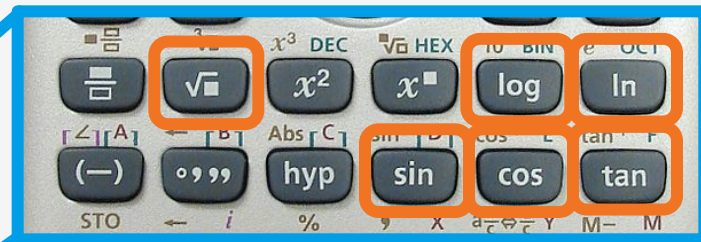
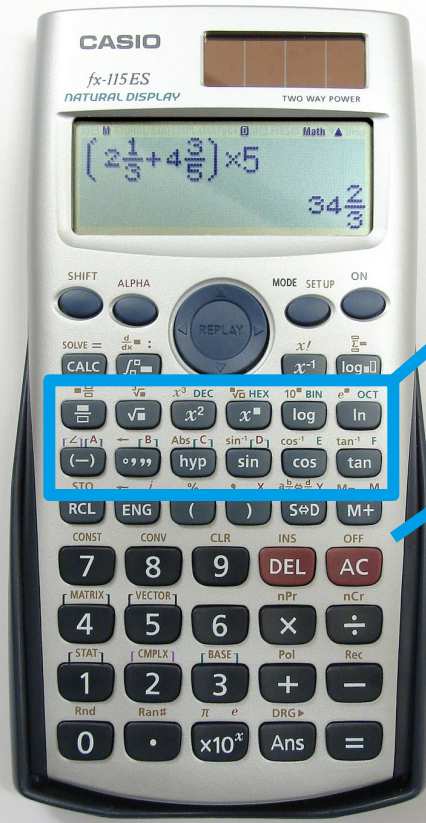
The degree

$$p(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x + a_0$$

For $x \gg 0$ or $x \ll 0$

$$p(x) \sim a_n x^n \quad \text{Behavior determined by degree!}$$

The calculator



Approximated by
polynomials!

$f(x)$



Thank you for your attention!



photo: Jorrit Lousberg