$f(x) = \boxed{k}\, x^p$; k : real # ; p : positive integer.

End behaviors of f.

	p : even (even power)	p : odd (odd power)
$k > 0$	As $x \to \infty$, $f(x) \to \infty$ As $x \to -\infty$, $f(x) \to \infty$	As $x \to \infty$, $f(x) \to \infty$ As $x \to -\infty$, $f(x) \to -\infty$
$k < 0$	As $x \to \infty$, $f(x) \to -\infty$ As $x \to -\infty$, $f(x) \to -\infty$	As $x \to \infty$, $f(x) \to -\infty$ As $x \to -\infty$, $f(x) \to \infty$

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Polynomial Functions: $n=3$; $a_3 = 2$; $a_2 = -3$; $a_1 = 1$; $a_0 = -10$

E.g. $f(x) = \boxed{2x^3}\boxed{-3x^{2}} + \boxed{x}\boxed{-10}$

$f(x) = x^{2016} - 2017\, x^{2015} + x^5 - x^3.$

Definition of a polynomial function.

A polynomial function is a function of the form

$f(x) = \boxed{a_n x^n} + \boxed{a_{n-1} x^{n-1}} + \cdots + \boxed{a_2 x^2} + \boxed{a_1 x} + \boxed{a_0}$

where $a_n, a_{n-1}, \ldots, a_2, a_1, a_0$ are constants (real #)

Every $a_i x^i$ is called a term.

E.g. $f(x) = (x-2)(x+1)$

$= x^2 + x - 2x - 2 = x^{\boxed{2}} - x^{1} - 2$

$a_2 = 1$; $a_1 = -1$; $a_0 = -2$

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$f(x) = (x-2)(x-3)(2x+1)(x-10)$

Important terminology about polynomial function

$f(x) = \boxed{\boxed{2}x^{\boxed{3}}} - 3x^2 + x - 10$

The highest power is called the degree of the poly.

$\boxed{\text{degree} = 3}$

The coefficient that goes with the highest power is called the $\boxed{\text{leading coefficient}}$. Leading coeff $= 2$

The term which contains the highest power is called the leading term. $\boxed{\text{leading term}: 2x^3}$

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In general,

$f(x) = \boxed{\boxed{a_n} x^{\boxed{n}}} + a_{n-1} x^{n-1} + \cdots + a_2 x^2 + a_1 x + a_0$

leading coefficient degree leading term.

E.g. $g(x) = 4x^2 - x^6 + 2x - 6.$

Degree $= 6$ leading coefficient: -1

leading term: $-x^6$

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$h(x) = x(5x^4 - 2x^2 + 7)$

$= 5x^5 - 2x^3 + 7x$

degree 5 ; leading coeff. 5 ; leading term $5x^5$.

$h(x) = (\boxed{2x^2} + x + 1)(\boxed{x^3} + 2x - 2)$

$2x^2 \cdot x^3 = 2x^5$

degree $= 5$; leading coeff. 2 ; leading term $2x^5$

$t(x) = (x-1)(-2x^4 + 2)(-\frac{1}{2}x^5 + x^4 + x^2 + 1)$

$x \cdot (-2x^4)(-\frac{1}{2}x^5) \cdot (-5x^7) = \boxed{-5}\, x^{\boxed{17}}$ $(-5x^7 + 10)$

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End behavior of a polynomial function

The end behavior of a polynomial function is exactly the same as the end behavior of its leading term.

E.g. $f(x) = 5x^4 + 2x^3 - x - 4.$

Determine the end behavior of f.

Leading term: $\boxed{5x^{\boxed{4}}}$

As $x \to \infty$, $f(x) \to \infty$; As $x \to -\infty$, $f(x) \to \infty$

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