Section 3.2. Polynomial Functions and their graphs

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Examples of polynomial functions:

$f(x) = x^3 - 2x^2 + 7x + 12.$

$f(x) = x^4(x-2)(x+1)$

Some terminology:

Given $f(x) = \boxed{2}x^{\boxed{5}} - x^4 - x^3 + 5x^2 + 7x - 12.$

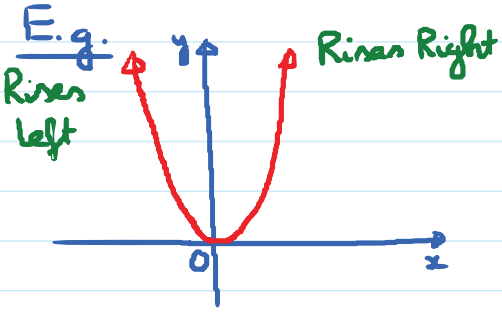
2 : leading coefficient

5 : degree

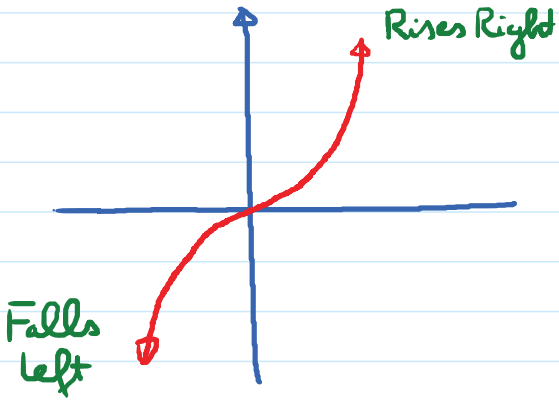
$2x^5$: Leading term.

Obj 1: End Behavior of Polynomial Functions.

E.g.:



$f(x) = 2x^2$



$f(x) = x^3$

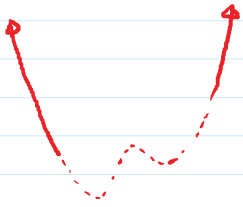
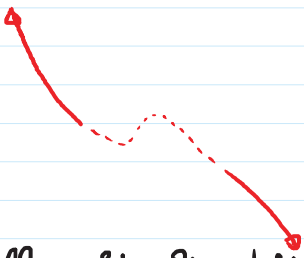
$f(x) = -2x^2$

$f(x) = -x^3$

* Using the Leading Term Test to determine the End Behavior of a Polynomial Function.

Suppose that the leading term of a polynomial function is $a_n \cdot x^n$ → degree

a_n → Leading Coeff.

	Degree n is EVEN	Degree n is ODD
Leading Coeff a_n is positive $a_n > 0$	 Rises Right, Rises left	 Rises Right, Falls left
Leading coeff a_n is negative $a_n < 0$	 Falls Right, Falls left	 Falls right, Rises left.

Leading term test: $a_n x^n$

	Even n	Odd n
$a_n > 0$	↖ ↗	↙ ↗
$a_n < 0$	↙ ↘	↖ ↘

E.g. Determine the end behavior of the graph of the given polynomial function

(a) $f(x) = 7x^3 + 3x^2 - x - 3$.

Degree = 3 → odd

Leading coeff. = 7 → $a_n > 0$

End Behavior: Rises right, falls left.

(b) $f(x) = -5x^4 + 4x^2$.

Degree = 4 → even

leading coeff. = -5 → $a_n < 0$

End Behavior: Falls right, falls left.

E.g. Given $f(x) = -4x^3 \cdot (x-1)^2 \cdot (x+5)$

Q1: Find the leading term of f.

Q2: Determine the end behavior of f.