Graphing Polynomials (2.8)

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

Ex: $f(x) = 3x^6 + 7x^5 - 5x^3 + 3x^2 + x - 2$

End behavior:

Degree: highest exponent Ex: 6

→ even − EB − same

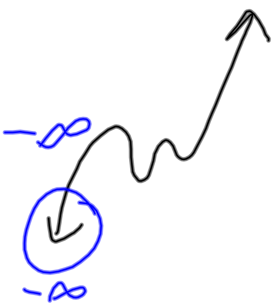
as $x \xrightarrow{\text{"approaches"}} -\infty$, $f(x) \to \infty$

as $x \to \infty$, $f(x) \to \infty$

→ odd − EB −

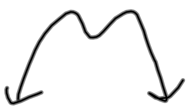
as $x \to -\infty$, $f(x) \to -\infty$

as $x \to \infty$, $f(x) \to \infty$

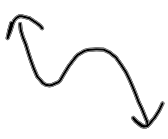


Note: If leading coefficient (a_n) (coefficient of highest degreed term) is negative, graph is reflected over the x-axis:

even →



odd →



Graph $f(x) = x^{\boxed{4}} + 3x^3 - x^2 - 4x \boxed{-5}$ y-int.

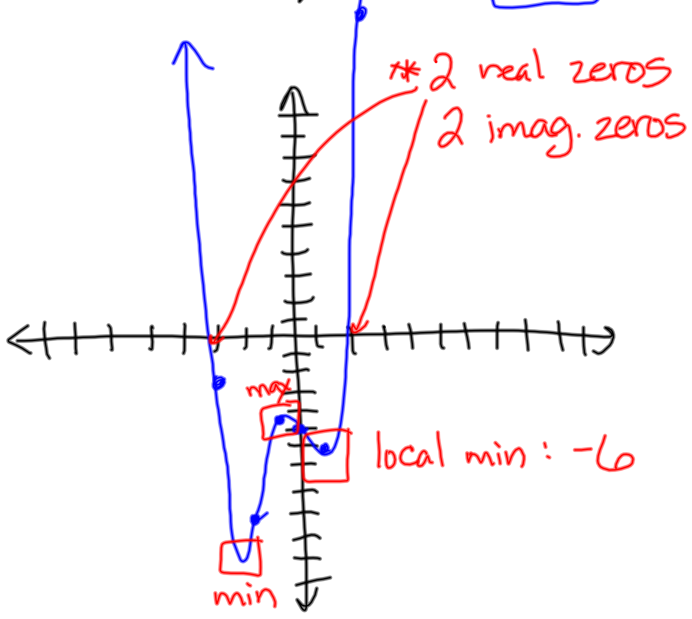
① y-int : -5
$(x=0)$

② EB ↑ ↑

③ # of turns
$\boxed{n-1}$
$4-1=3$

④

x	y
1	−6
2	23
−1	−4
−2	−9
−3	−2



$y = x^4 + 3x^3 - x^2 - 4x - 5$

1) $1 + 3 - 1 - 4 - 5 = -6$

$$\begin{array}{r|rrrrr} & 4 & 3 & 2 & 1 & 0 \\ 2 & 1 & 3 & -1 & -4 & -5 \\ & & 2 & 10 & 18 & 28 \\ \hline & 1 & 5 & 9 & 14 & 23 \end{array}$$

$-1)$ $1 - 3 - 1 + 4 - 5 = -4$

$$\begin{array}{r|rrrrr} -2 & 1 & 3 & -1 & -4 & -5 \\ & & -2 & -2 & 6 & -4 \\ \hline & 1 & 1 & -3 & 2 & -9 \end{array}$$

$$f(-3) \rightarrow \begin{array}{r|rrrr|r} -3 & 1 & 3 & -1 & -4 & -5 \\ & & -3 & 0 & 3 & 3 \\ \hline & 1 & 0 & -1 & -1 & -2 \end{array}$$

$$\begin{array}{r|rrrrr} -2.5 & 1 & 3 & -1 & -4 & -5 \\ & & -2.5 & -1.25 & +5.625 & -4.0625 \\ \hline & 1 & 0.5 & -2.25 & 1.625 & -9.1 \end{array}$$

Zeros / Roots / x-intercepts

- where the graph passes through the x-axis $(k, 0)$
- $y = 0 \rightarrow$ plug in to find.

A polynomial can have how many zeros? n (degree of polynomial)

↳ up to n real zeros. the remaining are imaginary

Ex: $f(x) = x^4 + 3x^3 - x^2 - 4x - 5$

$$0 = x^4 + 3x^3 - x^2 - 4x - 5$$

p. 148 (15 - 20)

Study Island