Graphing Polynomials at large x values

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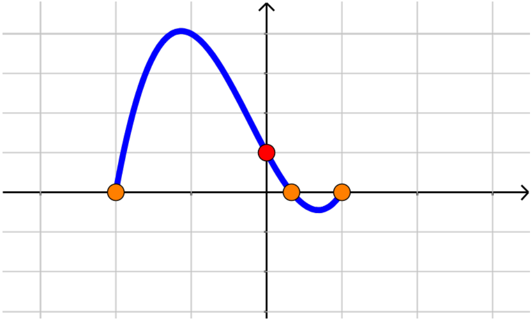

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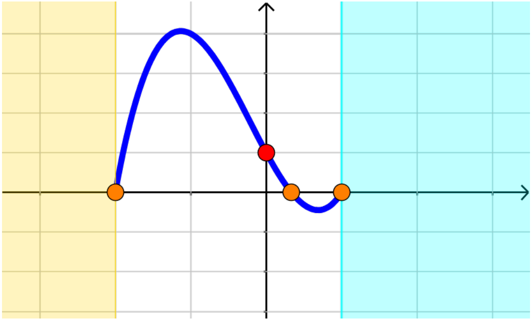

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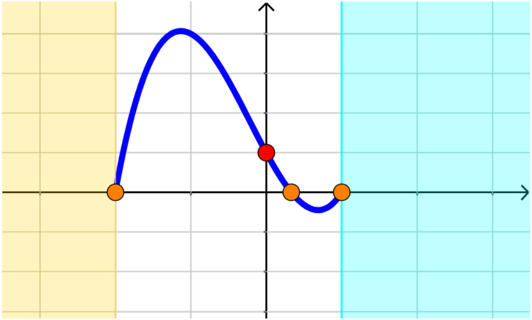

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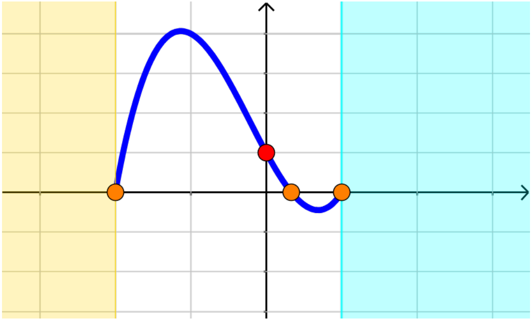
For large x, a polynomial: $P(x) = a_n x^n + a_{n-1}x^{n-1} + \cdots + a_1 x + a_o$

$$P(x) \approx a_n x^n$$



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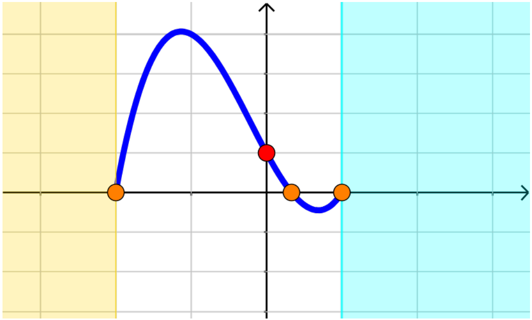

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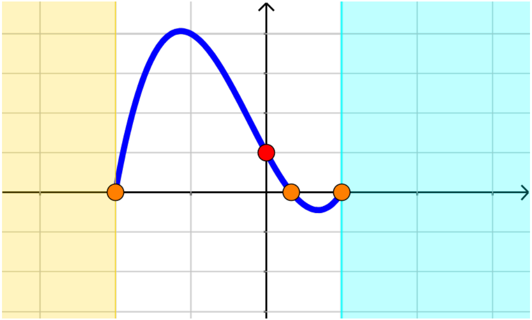

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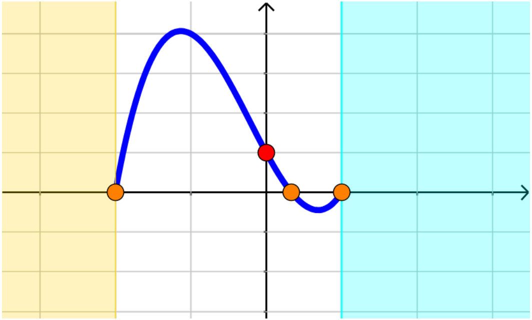
So, to understand how polynomials behave for large values of x, we look at how the lead term ($a_n x^n$) behaves for large values of x

We will abbreviate "large values of x" as: $x \to \infty$ or $x \to -\infty$



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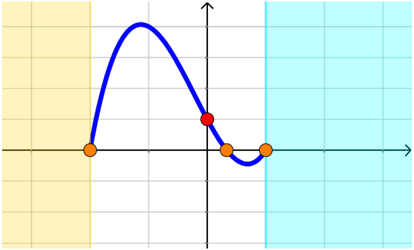


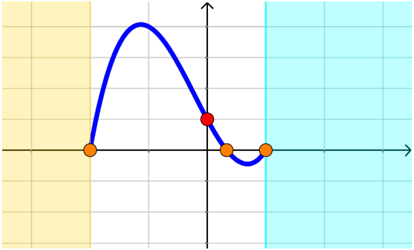
Graphing Polynomials at large x values

To complete our graph, we need to understand what happens for large x

$$P(x) \approx a_n x^n$$

Let's see what happens one side at a time, starting with the right side

For $x \to \infty$:



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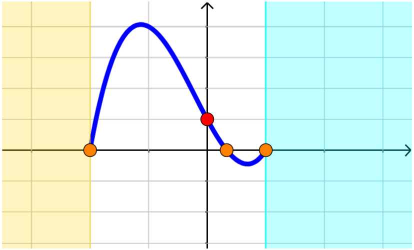

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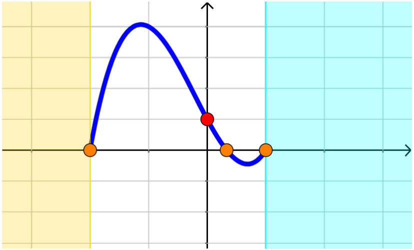

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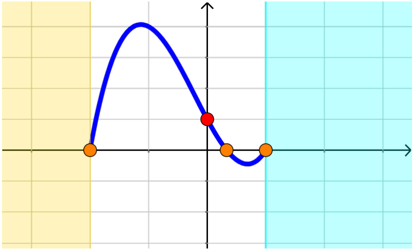

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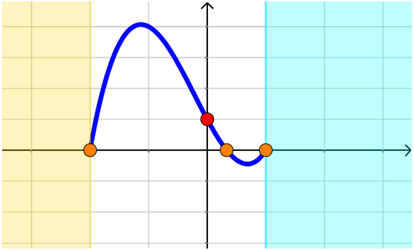

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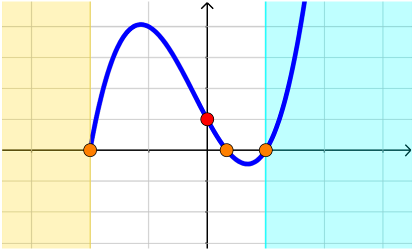

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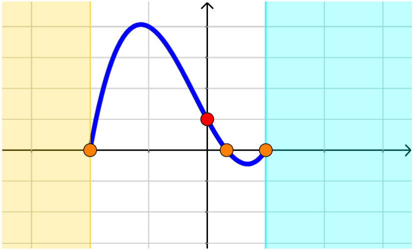

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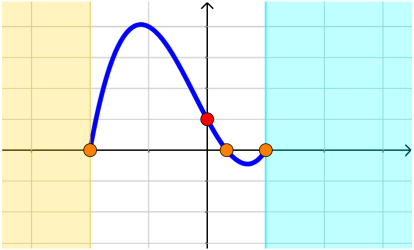

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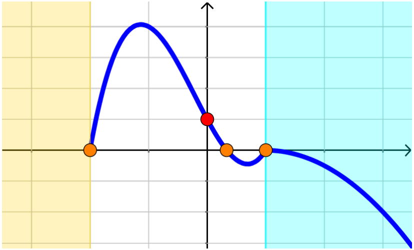

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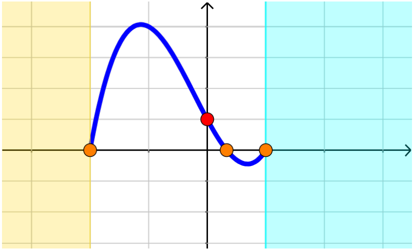

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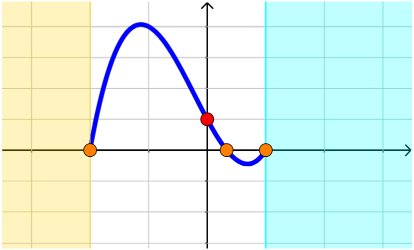

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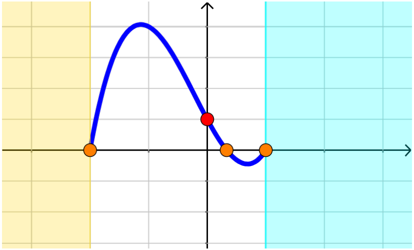

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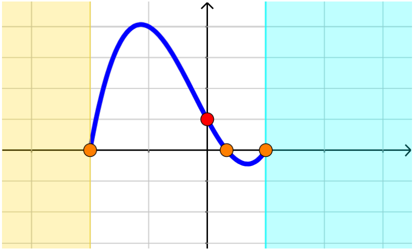

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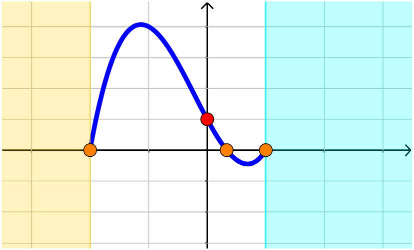

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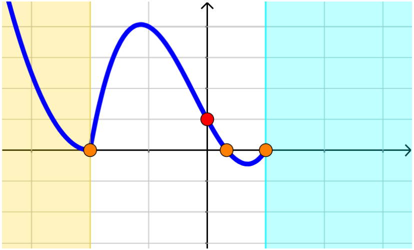

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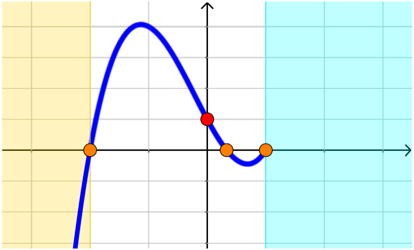

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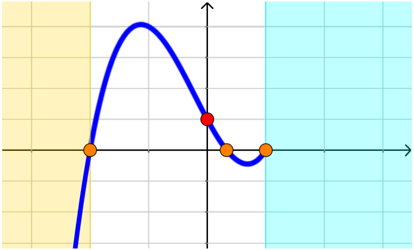

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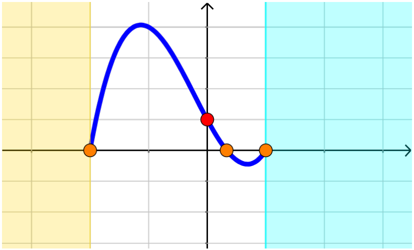

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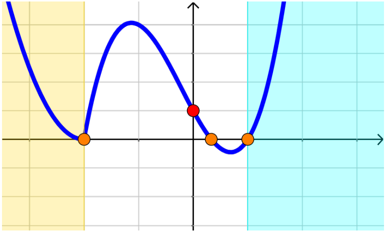

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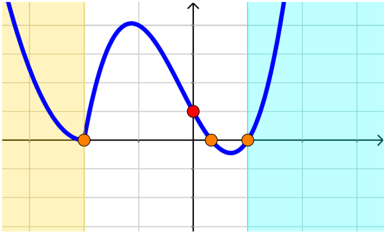

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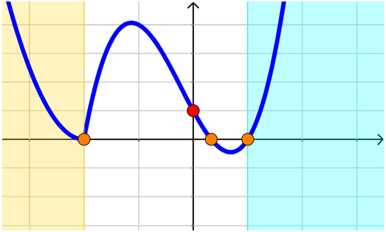

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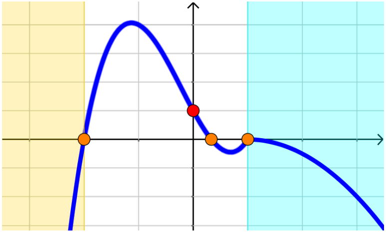

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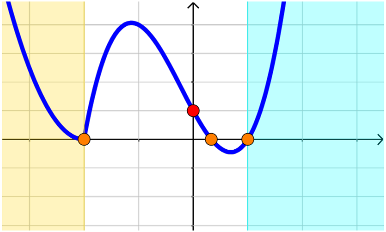

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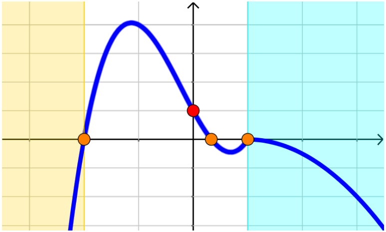

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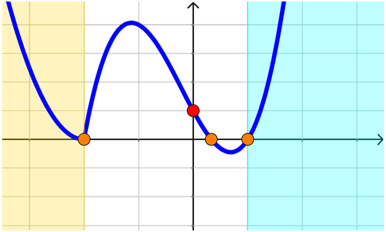

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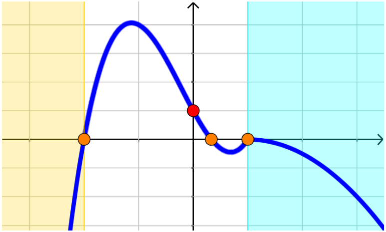

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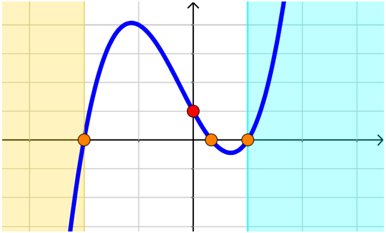

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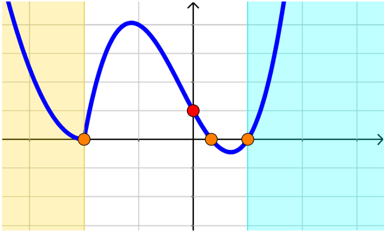

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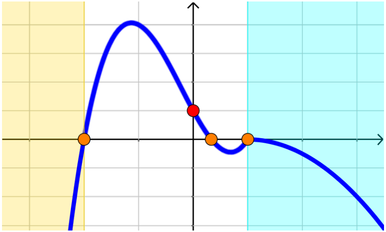

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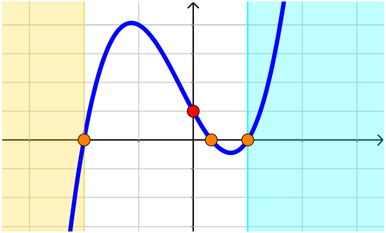

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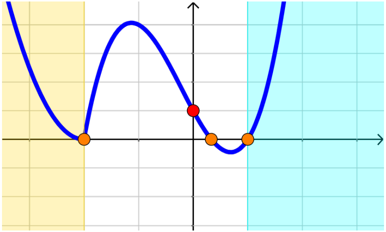

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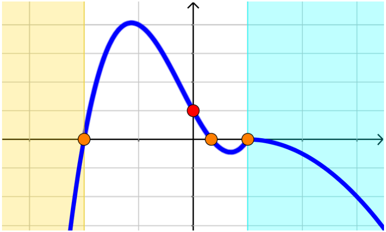

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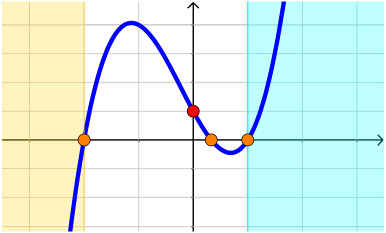
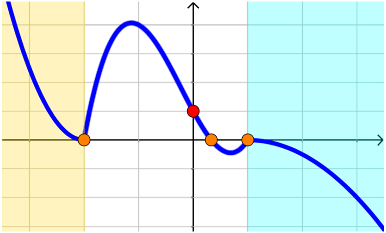


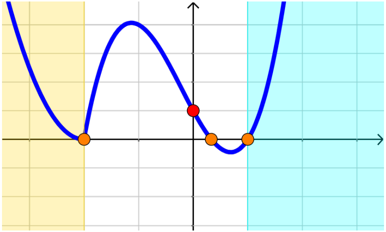
if n is odd and $a_n < 0$



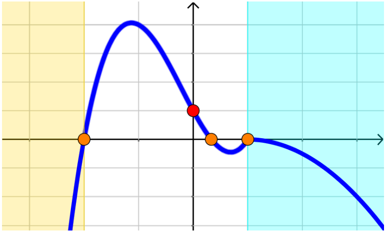
Graphing Polynomials at large x values

Using that $P(x) \approx a_n x^n$ Let's consolidate what we saw:

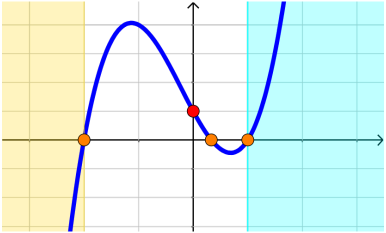
if n is even and $a_n > 0$



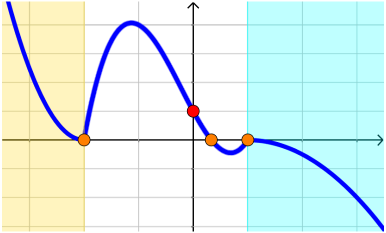
if n is even and $a_n < 0$



if n is odd and $a_n > 0$



if n is odd and $a_n < 0$



Note: It is easier to use this logic to figure out the end behavior for each graph than to memorize all of these scenarios!