Polynomials graphing

Exploring

$$x^5 - 11x^4 + 49x^3 - 111x^2 + 128x - 60$$

Do NOT plot it yet. We'll explore it first.

1. We already learned:
   1. How many terms?
   2. What is the degree?
   3. Leading coefficient sign?

2. Divide the polynomial by $(x - 3)$.

Exploring $x^5 - 11x^4 + 49x^3 - 111x^2 + 128x - 60$

1. Divide the polynomial by $(x-3)$, we get:

$$x^4 - 8x^3 + 25x^2 - 36x + 20$$

Dividend, Divisor, Quotient, Remainder.

Factor, zeros, roots. Linear Factors.

$$x^5 - 11x^4 + 49x^3 - 111x^2 + 128x - 60 = (x-3) \cdot (x^4 - 8x^3 + 25x^2 - 36x + 20)$$

2. Divide the polynomial by $(x-2)$

Exploring $x^5 - 11x^4 + 49x^3 - 111x^2 + 128x - 60$

1. Divide the polynomial by $(x-2)$, we get:

$$x^3 - 6x^2 + 13x - 10$$

Factor, zeros, roots.

$$x^5 - 11x^4 + 49x^3 - 111x^2 + 128x - 60 = (x-3) \cdot (x-2) \cdot (x^3 - 6x^2 + 13x - 10)$$

2. Divide the polynomial (again!!) by $(x-2)$

Exploring
$x^5 - 11x^4 + 49x^3 - 111x^2 + 128x - 60$

1. Divide the polynomial by $(x-2)$, we get:

$$x^2 - 4x + 5$$

Factor, zeros, roots.

$$x^5 - 11x^4 + 49x^3 - 111x^2 + 128x - 60 \quad = \quad (x-3)\cdot(x-2)^2\cdot(x^2-4x+5)$$

Multiplicity of roots.

2. What are the roots of $(x^2 - 4x + 5)$?

Exploring
$x^5 - 11x^4 + 49x^3 - 111x^2 + 128x - 60$

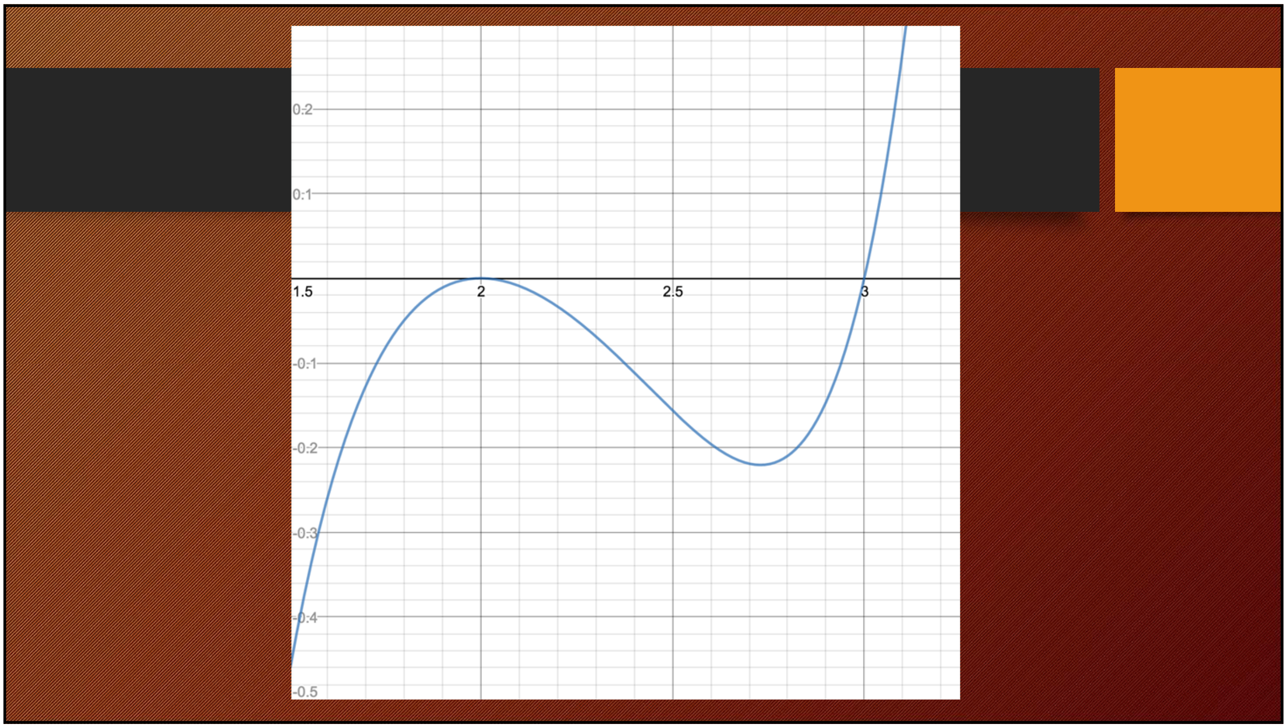
$$x^2 - 4x + 5 = \big(x - (2-i)\big)\cdot(x - (2+i))$$

Complex roots appear as conjugate pairs!!

$$x^5 - 11x^4 + 49x^3 - 111x^2 + 128x - 60 \quad = \quad (x-3)\cdot(x-2)^2\cdot(x^2-4x+5)$$

N-degree polynomial can be factored into n linear roots (complex).

Behavior/Plot


0.2
0.1
1.5
2
2.5
3
-0.1
-0.2
-0.3
-0.4
-0.5