5.7 Apply the Fundamental Theorem of Algebra

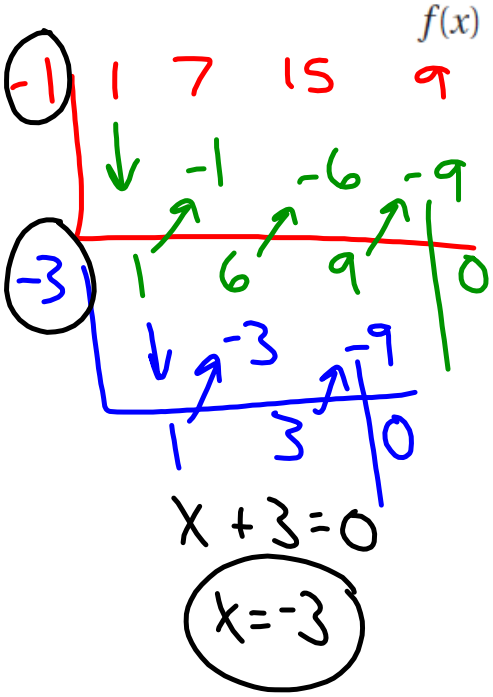
What is the Fundamental Theorem of Algebra?

Every polynomial has exactly the same # of solutions (zeros) as its degree. (may include i's)

EXAMPLE 2 **Find the zeros of a polynomial function**

Find all zeros of the polynomial function.

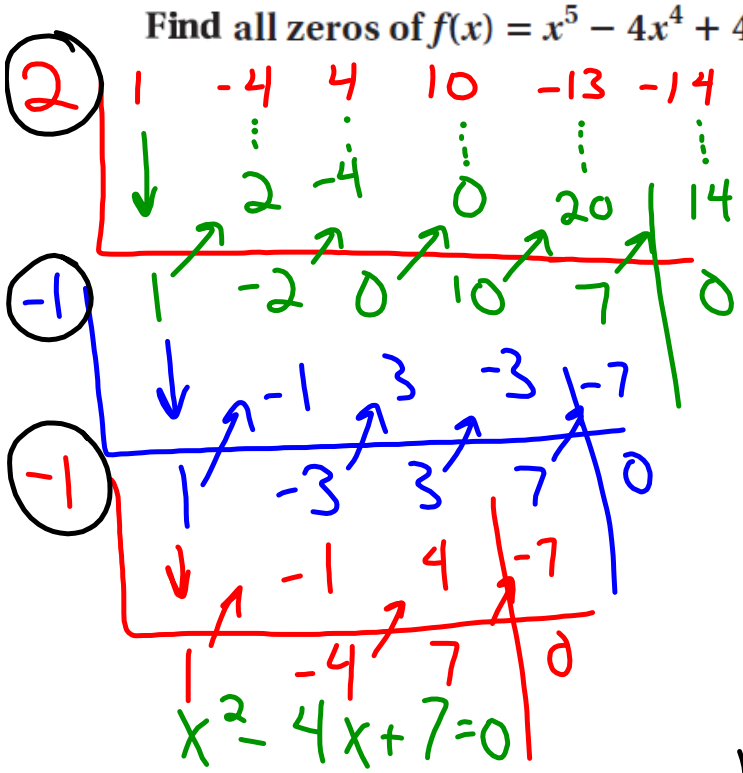
$$f(x) = x^3 + 7x^2 + 15x + 9$$



X = -1, -3, -3

EXAMPLE 2 **Find the zeros of a polynomial function**

Find all zeros of $f(x) = x^5 - 4x^4 + 4x^3 + 10x^2 - 13x - 14$.



$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$x = \frac{4 \pm \sqrt{(-4)^2-4(1)(7)}}{2(1)}$$

$$x = \frac{4 \pm \sqrt{16-28}}{2}$$

$$x = \frac{4 \pm \sqrt{-12}}{2}$$

$$x = \frac{4 \pm 2i\sqrt{3}}{2}$$

$$x = 2 \pm i\sqrt{3}$$

EXAMPLE 3 **Use zeros to write a polynomial function**

Write a polynomial function f of least degree that has rational coefficients, a leading coefficient of 1, and the given zeros.

$-1, 2, 4$

$4, 1 + \sqrt{5}$, $1-\sqrt{5}$

$3, 3 - i$, $3+i$

$x=-1$

$x+1=0$

$x=2$

$x-2=0$

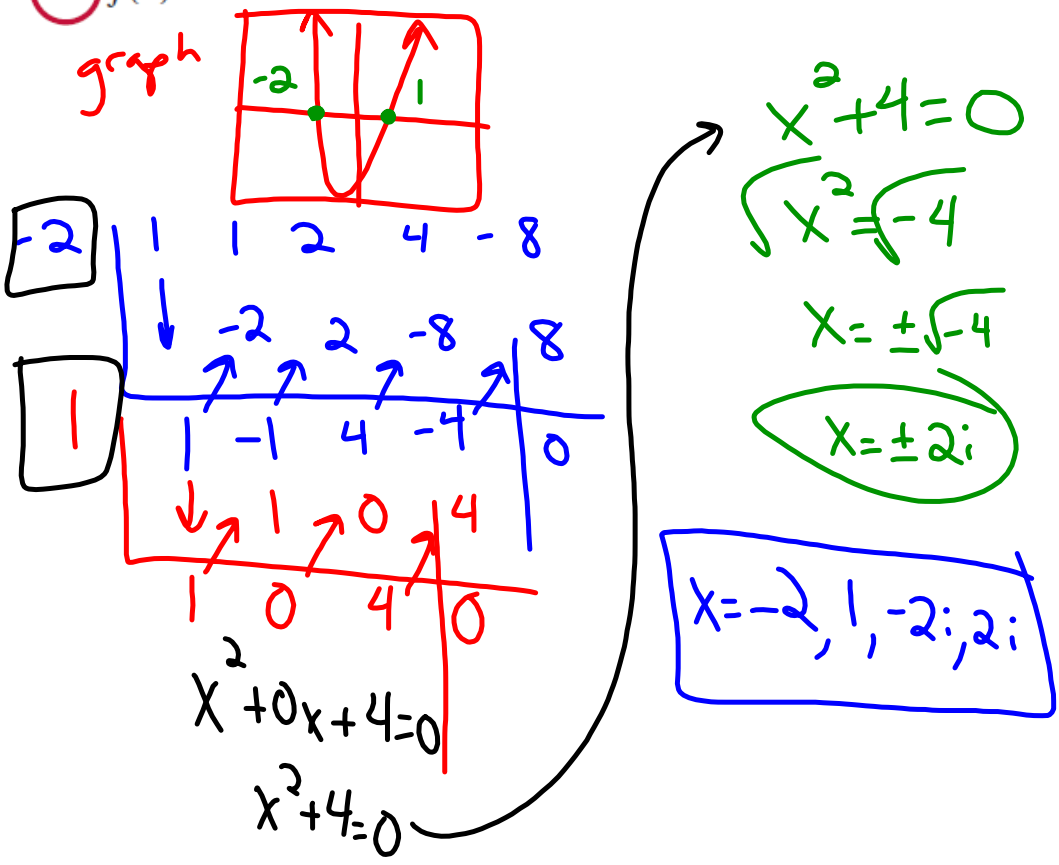
$f(x)=(x-4)(x-(1+\sqrt{5}))(x-(1-\sqrt{5}))$

$f(x)=(x-3)(x-(3-i))(x-(3+i))$

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

FINDING ZEROS Find all zeros of the polynomial function.

15. $f(x) = x^4 + x^3 + 2x^2 + 4x - 8$



WRITING POLYNOMIAL FUNCTIONS Write a polynomial function f of least degree that has rational coefficients, a leading coefficient of 1, and the given zeros.

24. $2, -i, i$