

Finding the rational zeros of a polynomial

So, this whole process can be laid out as follows:

1. List all possible zeros. List all possible rational zeros using the Rational Zero Theorem.
2. Divide. Use synthetic division to evaluate the polynomial at each of the possibilities for zeros that you found in step 1. Do this until you end with a remainder 0.
3. Repeat. Repeat steps 1 and 2 for the quotient. Stop when you reach a quotient that is quadratic (degree 2) or anything that can be factored easily. Once the quotient is reduced to a quadratic, you are done because you can either factor or use quadratic formula.

Example

Find all the real zeros of $P(x) = -x^3 - 3x^2 + 13x + 15$

Find all the real zeros of $P(x) = x^4 - 5x^3 - 5x^2 + 23x + 10$