

Re: complex roots of complex polynomials

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Carel wrote:

As an exercise I wrote a little program that can extract complex roots from a polynomial with complex coefficients.
I used Newton's method.

Actually, for single variable functions the 2nd order Newton method works far better.

Use equation #5 from this link
<http://mathworld.wolfram.com/HalleysIrrationalFormula.html>
(Look what happens when the second derivative term is zero ;))

The basic Newton's method assumes the function is well approximated by a straight line and then proceeds to find the root of that line. A major problem occurs whenever the slope of the line is near zero. This leads to chaotic and fractal behavior and can cause the number of iterations to increase dramatically depending on your starting guess. For arbitrary functions, at least 2 function evaluations are needed for each iteration to approximate the first derivative.

The 2nd order method assumes that the function can be approximated by a parabola and then proceeds to find both roots of the parabola. A slope of zero is no problem and the iterations converge cubically and with far less chaotic and fractal behavior. The cost of this improvement is the need to make 3 function evaluations for each iteration. But this extra cost is more than made up for by the faster convergence and, most importantly, far less chaotic behavior.

Could anyone verify the result?

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Why do you need us to verify the result?

Just plug your "root" into the equation and see if the result is very close to zero.

Hope this helps

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