

Re: Secant method vs Newton's method

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- *From:* dcorbit@xxxxxxxxxx
 - *Date:* 26 Sep 2006 17:50:18 -0700
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Schizoid Man wrote:

Hi,

Under what circumstances would I prefer the secant method to Newton's method?

If you are not able to compute derivatives of the function, you cannot use Newton's method (for instance -- you might have a function call from a library, but you do not even know what the function is and hence cannot determine the derivative).

If computation of derivatives is very expensive. Perhaps the derivatives are far more complex than the function itself.

If you already have a change in sign for the domain that brackets the root you are searching for and the problem will be solved in .0001 seconds by the Secant method anyway.

If the root in the interval you are searching for is a multiple root (or roots that are very, very close together), then Newton's method may converge slowly.

If your initial guess is bad, Newton's method may not converge at all.

It may (on the other hand) draw pretty pictures:

<http://spanky.triumf.ca/www/fractint/fractint.html>

Newton's method converges much faster and the number of function calls seem to be the same (if we assume the derivative is a function call).

Newton's method is not guaranteed to converge. You must have some preconditions such as:

1. The function must be smooth and differentiable
2. Your initial guess must be 'close enough' to the actual root

There are times when the "horrible" binary search is better than either

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of these methods (neither of which is guaranteed to converge, though the secant method converges for every case that Newton's method does and also for some that it doesn't converge.).

Interesting reading --- with a great deal of energy expended explaining the differences and similarities between Newton's method and the Secant method:

<http://www.cs.berkeley.edu/~wkahan/Math128/RealRoots.pdf>