

## Description

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Newton's Method is a process for finding an approximate solution to the function  $f(x) = 0$ .

The process is iterative, that is, it operates by finding successive approximations to the solution, each approximation closer to the real solution than the last, until you find an approximation that is "close enough."

- ▶ Close enough usually means the successive approximations are no longer differing from each other by a meaningful amount.
- ▶ e.g., perhaps each new approximation is only .0001 different from the previous approximation.

## The Method

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- 1 Find the derivative of  $f(x)$ .
- 2 Make a guess as to what the solution value might be; call this number  $x_0$ .
  - ▶ *The actual value doesn't matter*; it can be as accurate or wildly wrong as you wish, though the closer you are to the real value, the fewer times you'll need to go through the loop.

The loop:

- 3 Calculate the equation of the tangent line to the function at  $x_0$ .
  - ▶ Use  $f'(x)$  for the slope and  $(x_0, f(x_0))$  for the point.
- 4 Calculate the x-intercept of the tangent line.
  - ▶ i.e., set the equation equal to zero and solve for  $x$ .
- 5 Use the intercept for your new  $x_0$  and go back to Step 3.

Repeat Steps 3, 4, and 5 until  $x_0$  is "close enough."