



S'3.8 Newton's Method

Just one of many recursive methods for finding roots, when algebra & trig just won't suffice.

Newton's Method:

Goal: Find where $f(x) = 0$

Make a guess: $x_1 = \text{seed}$

Build tangent line @ $x = x_1$:

$$y = f'(x_1)(x - x_1) + f(x_1)$$

Find $x_2 = \text{where tangent line} = 0$

$$f'(x_1)(x - x_1) + f(x_1) \stackrel{\text{SET}}{=} 0$$

$$f'(x_1)(x - x_1) = -f(x_1)$$

$$x - x_1 = \frac{-f(x_1)}{f'(x_1)}$$

$$x_2 = x = x_1 - \frac{f(x_1)}{f'(x_1)}$$

x_2 will be the x_1 in the above and it will yield x_3

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$$f(x) = \sin x - x^2$$

$$\rightarrow f'(x) = \cos x - 2x$$

$$\text{So } x_{n+1} = x_n - \frac{\sin(x_n) - x_n^2}{\cos(x_n) - 2x_n}$$

In general

We Derived Recursion: $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$



