Module 2 - Non Linear Equations

ME3001 - Mechanical Engineering Analysis

Mechanical Engineering Tennessee Technological University

Topic 3 - The Newton-Raphson Method

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- Analytical vs. Numerical
- A Shooting Method: Graphical Explanation
- Taylor Series Derivation
- A Better Hammer!

Analytical vs. Numerical

Theoretical/Analytical Solution Techniques

- solving the equation using exact mathematics
- leads to an exact or analytical solution

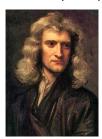
Numerical Solution Techniques

- approximating the solution to the equation using varying methods, or algorithms
- leads to a approximate solution
- a.k.a. Numerical Method

A Shooting Method: Graphical Explanation

These scientists changed the world forever.

- Isaac Newton, mathematician and physicist, 1642-1727
- Joseph Raphson, English Mathematician, 1648-1715





A Shooting Method: Graphical Explanation

The Newton-Raphson method is a shooting method.



Taylor Series Derivation

The method is derived from the Taylor series.

$$f(x) \approx f(a) + f'(a)(x-a) + \frac{f''(a)}{2!}(x-a)^2 + ... + \frac{f^{(n)}(a)}{n!}(x-a)^{(n)}$$

A Better Hammer!

Now you have much better hammer. However, must be used properly...

