Newton Raphson Method

AJM432

February 2022

Let $g(x)$ denote the tangent line of $f(x)$ at α. Then

$$f(\alpha) = \alpha f'(\alpha) + b$$

Therefore

$$b = f(\alpha) - \alpha f'(\alpha)$$

$$g(x) = f'(\alpha)x + f(\alpha) - \alpha f'(\alpha)$$

Now we must set $g(x) = 0$ to find a value of α closer to a root of $f(x)$.

$$f'(\alpha)x + f(\alpha) - \alpha f'(\alpha) = 0$$

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

Now we may set this value of x as our next point of iteration. Now we can input this x back into the tangent equation to get a value closer to a root.

$$\boxed{\alpha_{n+1} = \frac{\alpha_n f'(\alpha_n) - f(\alpha_n)}{f'(\alpha_n)}}$$

Now we may iterate the above equation starting at an arbitrary value for α until α_{n+1} approaches a fixed value.