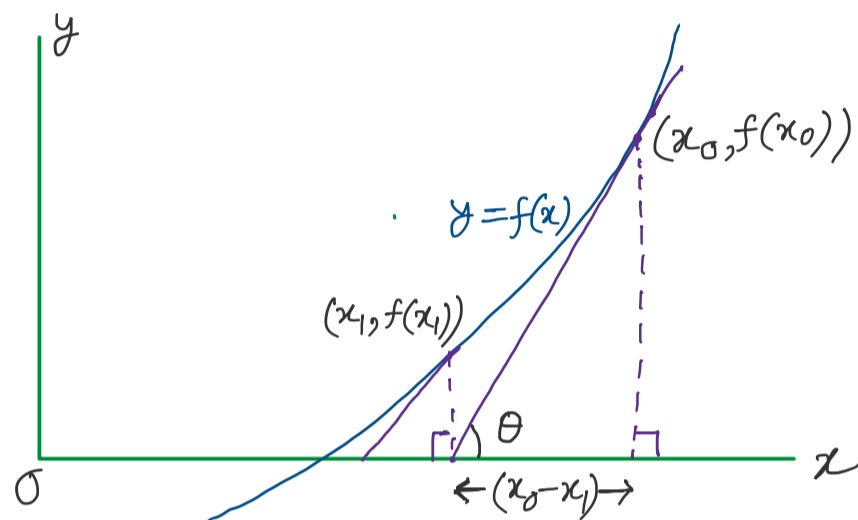


Geometric Interpretation of Newton-Raphson Method

Monday, 6 April 2020 1:07 PM

- ✓ NR method is a numerical method to find the roots of Algebraic and transcendental Equations
- ✓ Here we have provided the geometrical meaning of NR method.

- Let $y = f(x)$ be the graph of the equation



- ✓ Let x_0 be the initial guess.
- ✓ Draw a tangent to $y = f(x)$ at the point $(x_0, f(x_0))$
- ✓ Let the tangent cuts x axis at x_1 and makes angle θ with x axis

Then,

$$\tan \theta = \frac{f(x_0)}{x_0 - x_1}$$

$$\Rightarrow f'(x_0) = \frac{f(x_0)}{x_0 - x_1} \quad [\because f'(x_0) = \tan \theta]$$

$$\Rightarrow x_0 - x_1 = \frac{f(x_0)}{f'(x_0)}$$

$$\Rightarrow x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

- ✓ Now, draw tangent to $y = f(x)$ at $(x_1, f(x_1))$, which cuts x -axis at x_2 (say), then, similarly,

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

- ✓ This iterative process yields the formula

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

[Signature]