Graphical Derivation of Newton-Raphson Method

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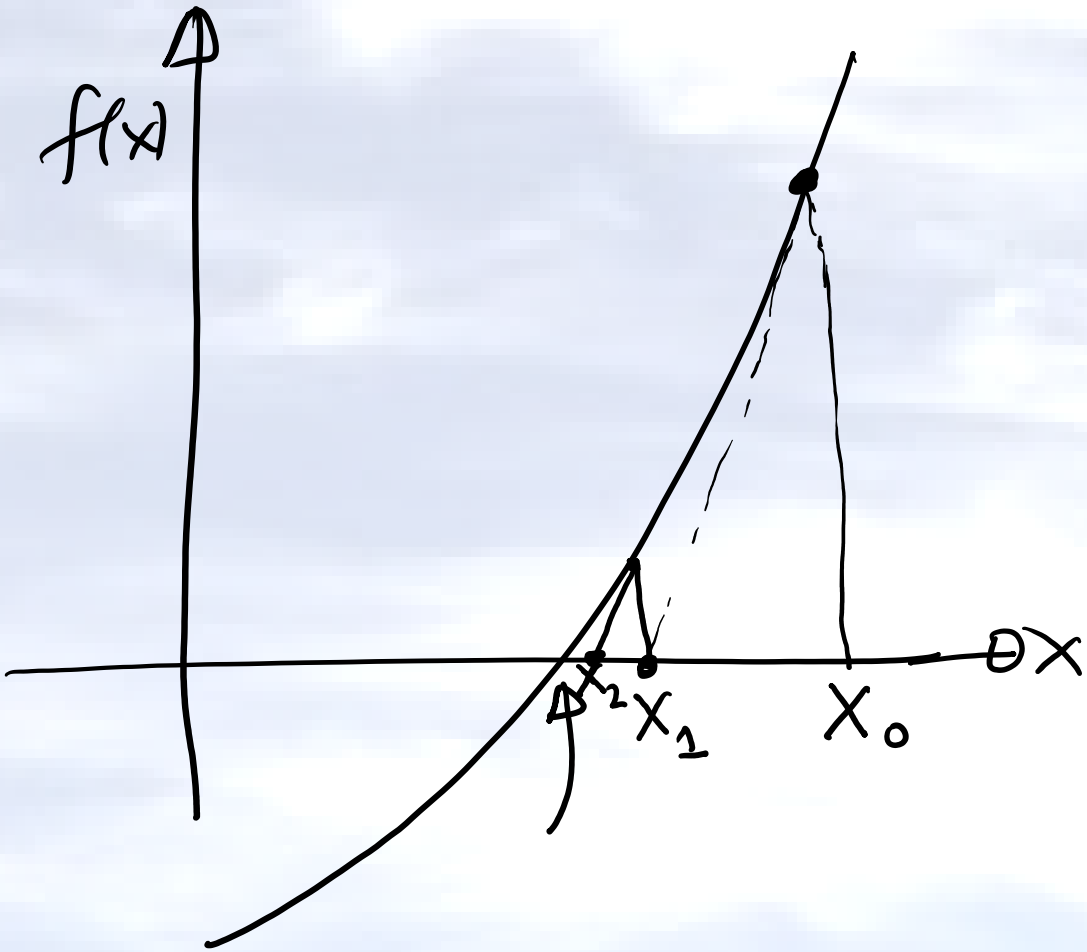
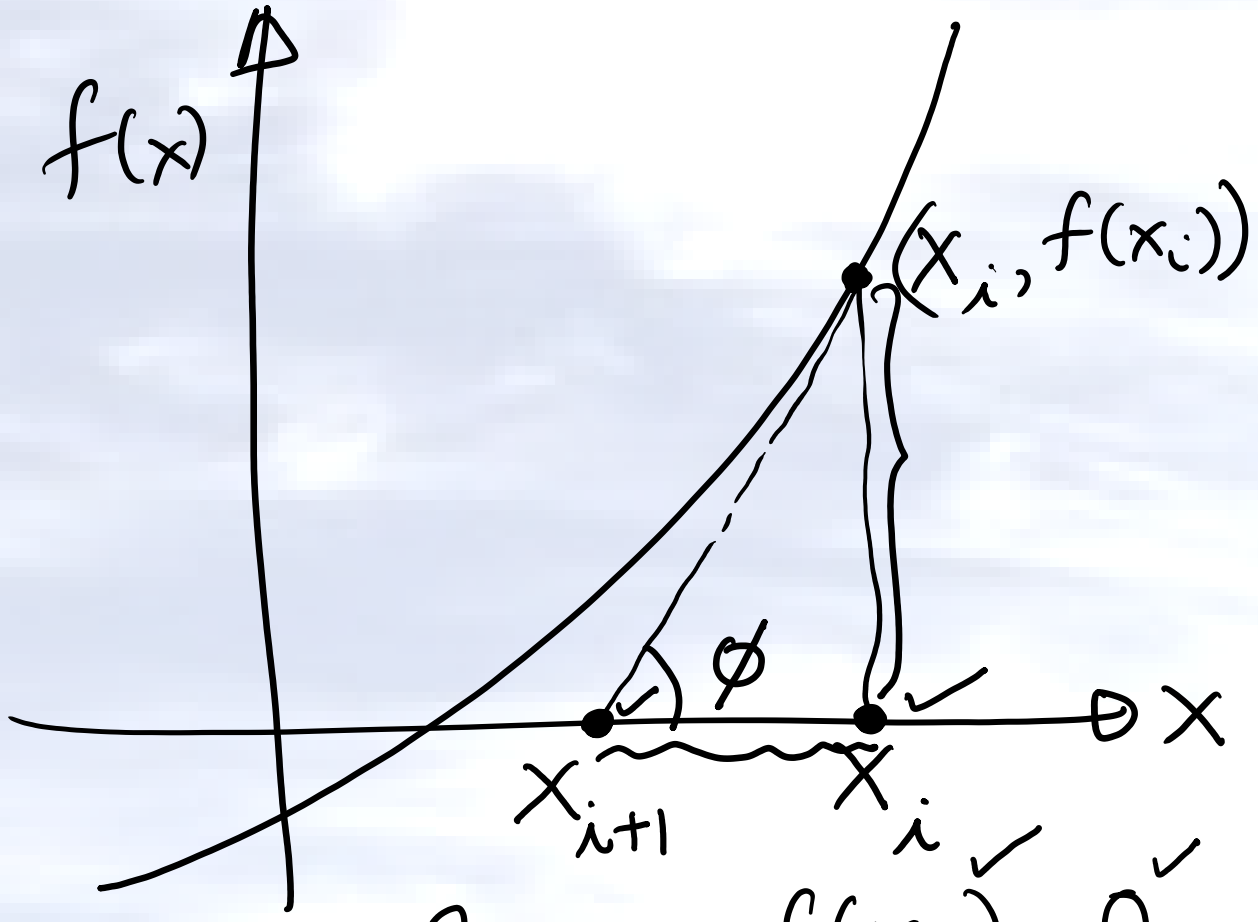
$f(x)=0$





$$\tan\phi = \frac{\text{Rise}}{\text{Run}} = \frac{f(x_i) - 0}{x_i - x_{i+1}}$$

$$f'(x_i) = \frac{f(x_i)}{x_i - x_{i+1}}$$

$$f'(x_i) = \frac{f(x_i)}{x_i - x_{i+1}}$$

$$x_i - x_{i+1} = \frac{f(x_i)}{f'(x_i)}$$

$$x_i - \frac{f(x_i)}{f'(x_i)} = x_{i+1}$$

$$\boxed{x_{i+1} = x_i - \frac{f(x_i)}{f'(x_i)}}$$

Algorithm of the N-R method: $f(x)=0$

1) Find $f'(x)$ symbolically.

2) $X_{i+1} = X_i - \dfrac{f(X_i)}{f'(X_i)}$ ✓

3) $|\epsilon_a| = \left|\dfrac{X_{i+1} - X_i}{X_{i+1}}\right| \times 100$ ✓

4) If $|\epsilon_a| < \epsilon_s$ or max. iterations reached

Then STOP

else go to step 2.

END

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