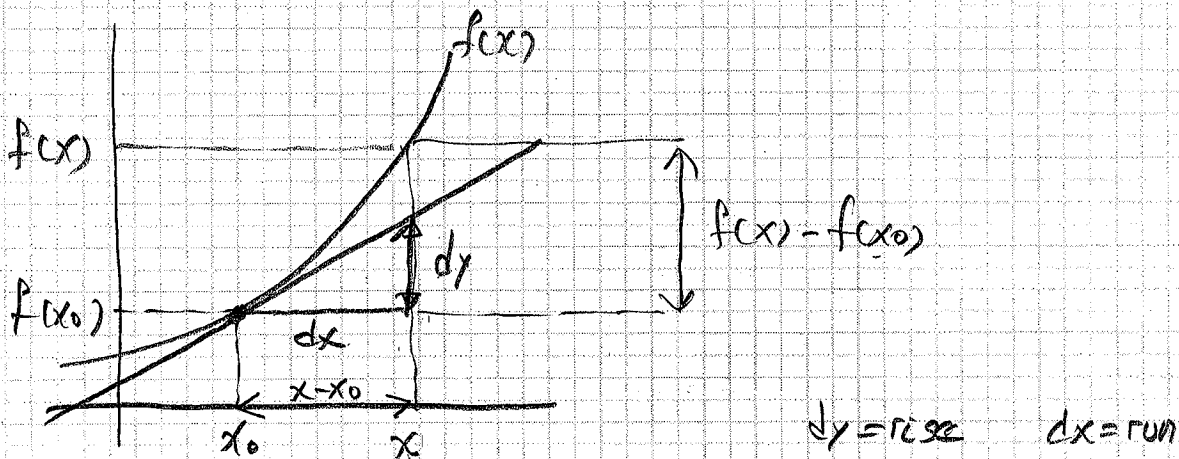


LOCAL LINEAR APPROXIMATIONS

$$\boxed{\frac{f(x) - f(x_0)}{x - x_0} \approx f'(x_0) = \frac{dy}{dx}}$$

differential

$$f(x) - f(x_0) \approx f'(x_0) \cdot (x - x_0)$$

$$\boxed{f(x) \approx f(x_0) + f'(x_0)(x - x_0)}$$

local linear approximation

$$\boxed{\Delta f \approx f'(x_0) \Delta x}$$

Ex: Find the local linear approximation of  $\sqrt[3]{8.1}$

$$f(x) = \sqrt[3]{x} = x^{1/3} \quad x_0 = 8$$

$$\sqrt[3]{8.1} = f(8.1) \approx f(8) + f'(8)(8.1 - 8)$$

$$f(8) = \sqrt[3]{8} = 2 \quad f'(x) = \frac{1}{3} x^{-2/3} = \frac{1}{3 \sqrt[3]{x^2}} \Rightarrow f'(8) = \frac{1}{3 \sqrt[3]{8^2}} = \frac{1}{12}$$

$$\sqrt[3]{8.1} \approx 2 + \frac{1}{12} \cdot 0.1 = 2.008\bar{3}$$

calculator = 2.00829885