Find the linearization of $\sqrt{x}$ at $x = 4$

I.e, find the best linear approximation of $\sqrt{x}$ for x close to 4.

I.e, find the equation of tangent line to $\sqrt{x}$ at $x = 4$.

Approximate $\sqrt{5}$

Method 1: Use equation of tangent line

Method 2 (optional, but quicker): Use $\Delta y \sim dy$

Recall: slope of secant line $= \frac{\Delta y}{\Delta x}$

$$\Delta x = x + h - x, \quad \Delta y = f(x + h) - f(x) = f(x + \Delta x) - f(x)$$

slope of tangent line $= f'(x) = \frac{dy}{dx}$. Thus $dy = f'(x)dx$.

Let $\Delta x = dx$. Then $\Delta y \sim dy$

$$f(x + \Delta x) = f(x) + \Delta y \sim f(x) + dy$$