H.W. Find $\frac{dy}{dx}$ Approximate Δy when $x = 2$, $\Delta x = 0.1$ and $\Delta x = -0.2$

Compare the actual Δy to find the errors.

$y = 10 + \sqrt{x}$

x	y	$dy/dx = \frac{1}{2\sqrt{x}}$
0	10	undefined
1	11	0.5
2	11.4	0.35
3	11.7	0.29

Ans

$\frac{dy}{dx} = \frac{d(10 + x^{\frac{1}{2}})}{dx}$

$= \frac{1}{2} x^{-\frac{1}{2}} = \frac{1}{2\sqrt{x}}$

$\therefore \frac{1}{2\sqrt{2}} = 0.35$

① when $x = 2$, $\Delta x = 0.1$

$y = 10 + \sqrt{x}$, $y = 10 + \sqrt{2}$

$x = 2 \rightarrow x = 2.1$

$X = 2.1$, $y = 10 + \sqrt{2.1}$

$\Delta y_1 = (10 + \sqrt{2.1}) - (10 + \sqrt{2})$

$(10 + \sqrt{2.1}) - (11.4) = 0.04$

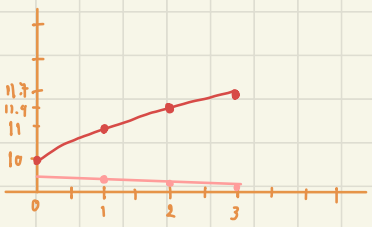
(slope) $\Delta y = \frac{dy}{dx} \cdot \Delta x$

$\Delta y_2 = 0.35 \cdot (0.1)$

$= 0.035$

$\therefore 0.04 - 0.035 = 0.005$

The first error is 0.005.



Is means as X increase the slope is decresing.

② when $x = 2$, $\Delta x = -0.2$

$y = 10 + \sqrt{x}$, $y = 10 + \sqrt{2}$

$x = 2 \rightarrow X = 1.8$

$X = 1.8$, $y = 10 + \sqrt{1.8}$

$\Delta y_1 = (10 + \sqrt{2}) - (10 + \sqrt{1.8})$

$= 11.41 - 11.37$

$= 0.07$

$\Delta y_2 = m \Delta x$

$= 0.35(-0.2)$

$= -0.07$

$\therefore 0.07 - (-0.07)$

$= 0.07 + 0.07$

$= 0.14$

The second error is 0.14.

H.W Find 2nd order derivative of $y = 10 + \sqrt{x}$ and plot the graph of y and $\frac{dy}{dx}$.

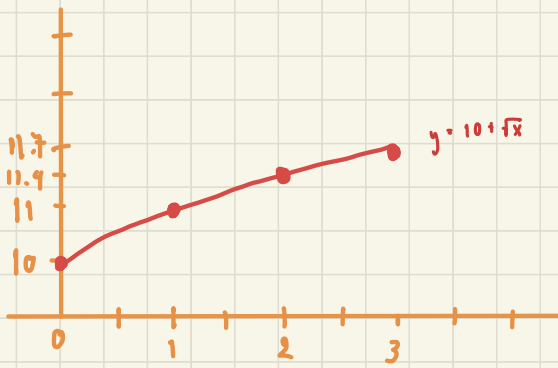
Is the slope of slope a constant.

Ans

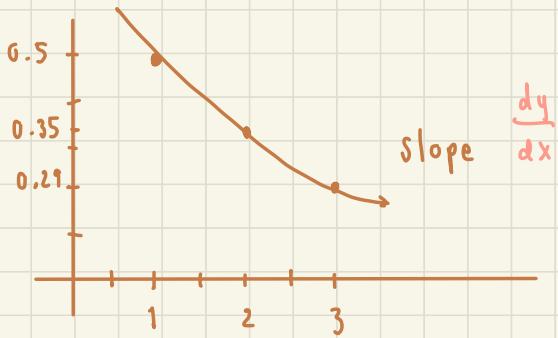
$$\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right)$$

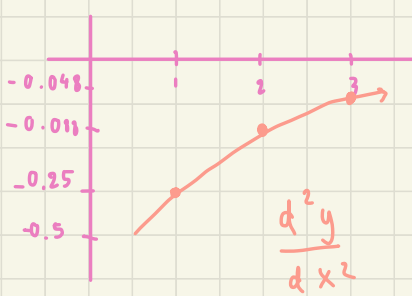
$$\frac{d(10+\sqrt{x})}{dx} = \frac{1}{2}x^{-\frac{1}{2}}$$

$$\frac{d\left(\frac{1}{2}x^{-\frac{1}{2}}\right)}{dx} = -\frac{1}{4}x^{-\frac{3}{2}}$$



x	y	$dy/dx = \frac{1}{2\sqrt{x}}$	$\frac{d^2y}{dx^2} = -\frac{1}{4}x^{-\frac{3}{2}}$
0	10	undefined	undefined
1	11	0.5	-0.25
2	11.4	0.35	-0.088
3	11.7	0.29	-0.048





∴ Slope of Slope is Not Constant.