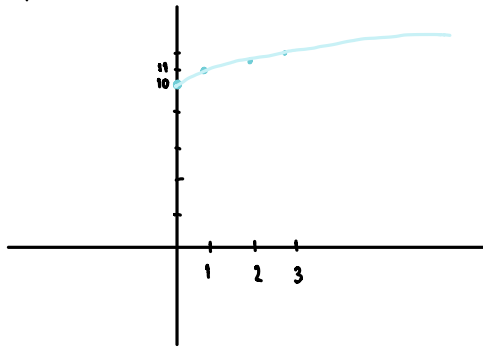


homework

1)

Find 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
0	10	0
1	11	0.5
2	11.41	0.35
3	11.73	0.28

$$x \rightarrow 2, y = 10 + \sqrt{2} = 11.41$$

$$x \rightarrow 3, y = 10 + \sqrt{3} = 11.73$$

$$\begin{aligned} y &= 10 + \sqrt{x} \\ &= 10 + x^{\frac{1}{2}} \quad \text{dis. from d} \\ &= 0.5 x^{-\frac{1}{2}} \\ &= \frac{0.5}{\sqrt{x}} \end{aligned}$$

when $x = 2$, $y = 11.41$ and slope

$$\begin{aligned} \Delta x = 0.1 &\rightarrow \Delta y = \frac{dy}{dx} \times \Delta x \\ &= \frac{1}{2} (2.1)^{-\frac{1}{2}} \times 0.1 \\ &= 0.0345 \end{aligned}$$

Real change in y

$$\begin{aligned} y &= 10 + \sqrt{2.1} = 11.449 \\ \therefore 11.449 - 11.41 &= 0.0391 \end{aligned}$$

$$\text{Error} = 0.0391 - 0.0345 = 0.0046$$

$$\begin{aligned} \Delta x = -0.2 &\rightarrow \Delta y = \frac{1}{2} (1.8)^{-\frac{1}{2}} \times -0.2 \\ &= -0.0877 \end{aligned}$$

Real change in y

$$\begin{aligned} y &= 10 + \sqrt{1.8} = 11.341 \\ \therefore 11.341 - 11.41 &= -0.068 \end{aligned}$$

$$\text{Error} = -0.068 - (-0.0877) = 0.0197$$

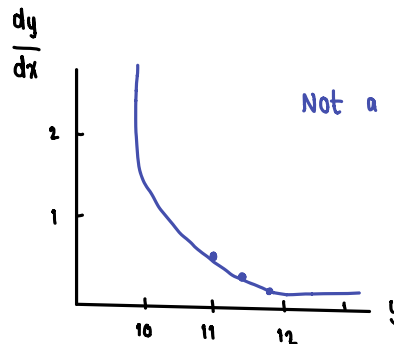
- 2) Find 2nd-order derivative of $y = 10 + \sqrt{x}$ and plot the graph of y and $\frac{dy}{dx}$. Is the slope of slope a constant?

2nd - derivative

$$\begin{aligned} y &= 0.5 x^{-\frac{1}{2}} \\ &= (0.5 \times 0.5) x^{-\frac{1}{2} - \frac{3}{2}} \\ &= \frac{1}{4} x^{-\frac{3}{2}} \end{aligned}$$

$$\begin{aligned} y &= 10 + x^{\frac{1}{2}} \\ y &= 10 + \sqrt{x} \end{aligned}$$

x	y	dy/dx	dy ² /dx ²
0	10	undefined	0
1	11	0.5	0.25
2	11.41	0.35	0.0156
3	11.73	0.28	0.0045



Not a constant slope of slope