

Homework $y = 10 + \sqrt{x}$

find $\frac{dy}{dx} = 10 + \sqrt{x}$
 $= 10 + x^{1/2}$
 $= \frac{1}{2} x^{-1/2}$
 $= \frac{1}{2\sqrt{x}}$

Approx: Δy

when $x=2$, $\Delta x = 0.1$

and $\Delta x = -0.2$

Compare the actual Δy
 to find the errors

x	y	$\frac{dy}{dx}$
0	10	0
1	11	$\frac{1}{2}$
2	$10 + \sqrt{2}$	$\frac{1}{2\sqrt{2}}$
3	$10 + \sqrt{3}$	$\frac{1}{2\sqrt{3}}$

$$\Delta y \approx \frac{dy}{dx} \cdot \Delta x$$

$$\Delta y \approx \frac{1}{2\sqrt{2}} \cdot 0.1$$

$$\Delta y \approx \frac{\sqrt{2}}{40} \approx 0.0353$$

when $x=2$, $y = 10 + \sqrt{2} \approx 11.41421356$

$$\Delta y = (10 + \sqrt{2}) - 0.0353 \approx 11.37885822$$

$$\Delta y \approx \frac{1}{2\sqrt{2}} \cdot -0.2$$

$$\Delta y \approx -\frac{\sqrt{2}}{20}$$

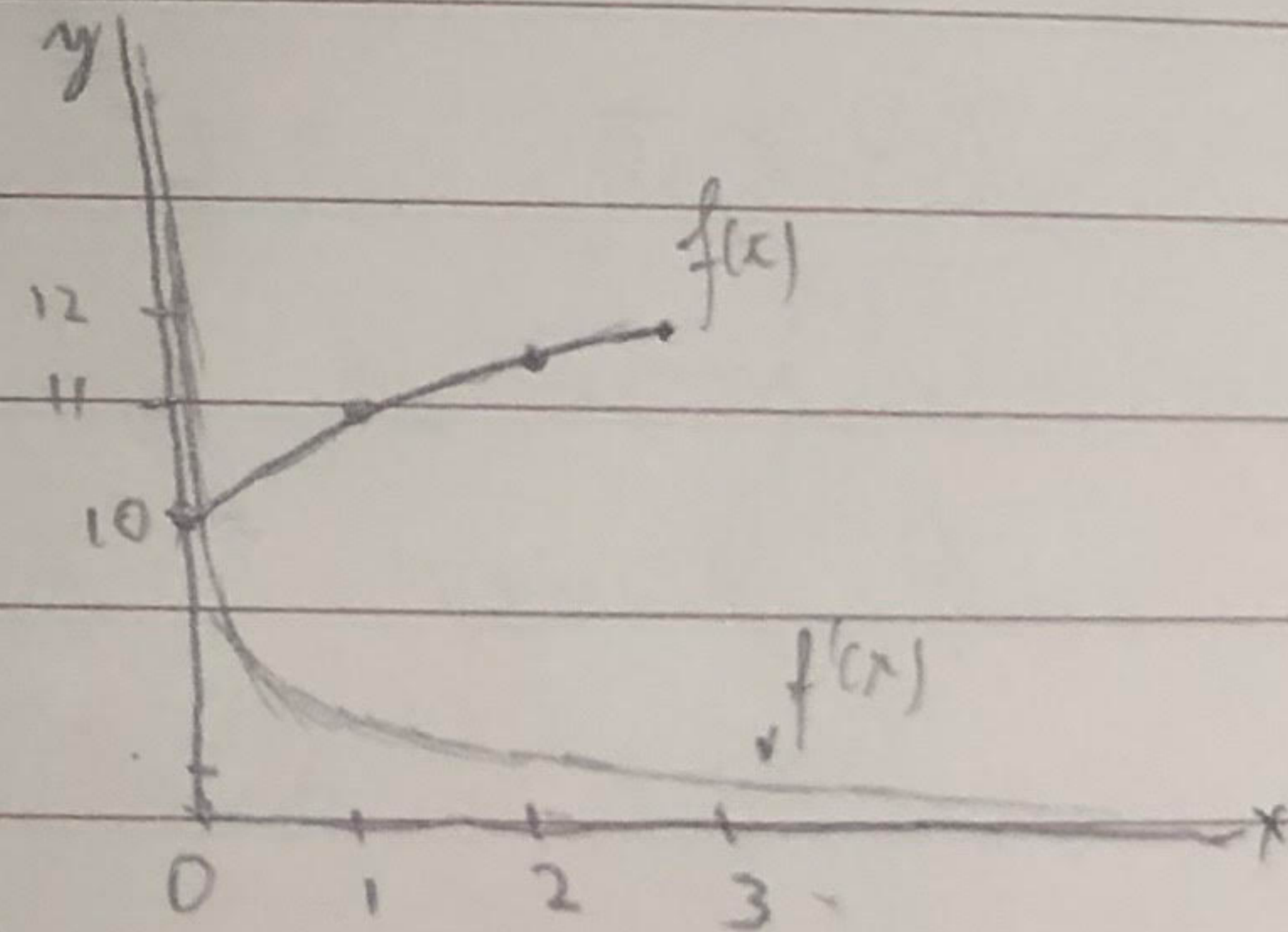
when $x=2$, $y = 10 + \sqrt{2} \approx 11.41421356$

$$\Delta y = (10 + \sqrt{2}) - \left(-\frac{\sqrt{2}}{20}\right) \approx 11.48492424$$

Errors: As the Δx Increases, Δy Decreases
 - Δx Decreases, Δy Increases

Prob. 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

x	y	$\frac{dy}{dx} = \frac{1}{2\sqrt{x}}$	$\frac{d^2y}{dx^2} = \frac{1}{2} \cdot x^{-1/2} = -\frac{1}{4} \cdot x^{-3/2}$
0	10	0	$-\frac{1}{4 \cdot 2\sqrt{0^3}} = 0$
1	11	$\frac{1}{2}$	$-\frac{1}{4 \cdot 2\sqrt{1^3}} = -\frac{1}{4}$
2	$10 + \sqrt{2}$	$\frac{1}{2\sqrt{2}}$	$-\frac{1}{4 \cdot 2\sqrt{2^3}} = -\frac{1}{4 \cdot 2\sqrt{2}} = -\frac{1}{8\sqrt{2}} \approx -0.0883$
3	$10 + \sqrt{3}$	$\frac{1}{2\sqrt{3}}$	$-\frac{1}{4 \cdot 2\sqrt{3^3}} = -\frac{1}{4 \cdot (3\sqrt{3})} = -\frac{1}{12\sqrt{3}} \approx -0.058925$



$\therefore$ The slope is not a constant.