H.W.

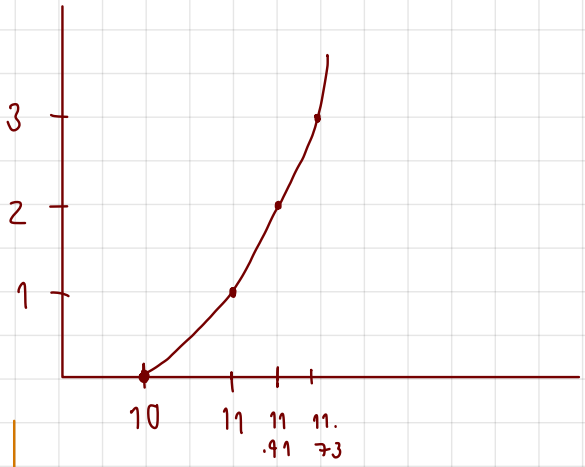
$y = 10 + \sqrt{x}$

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 error

X	Y	dy/dx
0	10	undefined
1	11	$\frac{1}{2}$
2	$10+\sqrt{2}$ $= 11.41$	$\frac{\sqrt{2}}{4}$
3	$10+\sqrt{3}$ $= 11.73$	$\frac{\sqrt{3}}{6}$



$y' = \frac{x^{-\frac{1}{2}}}{2}$

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

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

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

$= \frac{\sqrt{2}}{4} \cdot (.1)$

$= \frac{\sqrt{2}}{40} = 0.035$

real change in y

$x = 2.1$, $y = 10 + \sqrt{2.1} = 11.45$

$\therefore \Delta y = 11.45 - 11.41 = 0.04$

$0.05 - 0.035 = 0.015$ ✱

- when $x = 2$, $\Delta x = -0.2$

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

$= \frac{\sqrt{2}}{4} \cdot (-.2)$

$= -\frac{\sqrt{2}}{20} = -0.07$

real change in y

$x = 1.8$, $y = 10 + \sqrt{1.8} = 11.34$

$\therefore \Delta y = 11.41 - 11.34 = 0.07$

$0.07 - 0.07 = 0$ ✱

Hw.

Find 2^{nd} - order of 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	$dy/dx = \frac{1}{2\sqrt{x}}$	$\frac{d^2y}{dx^2} = \frac{1}{2x\sqrt{x}}$
0	10	undefined	undefined
1	11	$\frac{1}{2} = 0.5$	$\frac{1}{2} = 0.5$
2	$10+\sqrt{2}$	$\frac{1}{2\sqrt{2}} = 0.35$	$\frac{1}{4\sqrt{2}} = 0.18$
3	$10+\sqrt{3}$	$\frac{1}{2\sqrt{3}} = 0.29$	$\frac{1}{6\sqrt{3}} = 0.10$

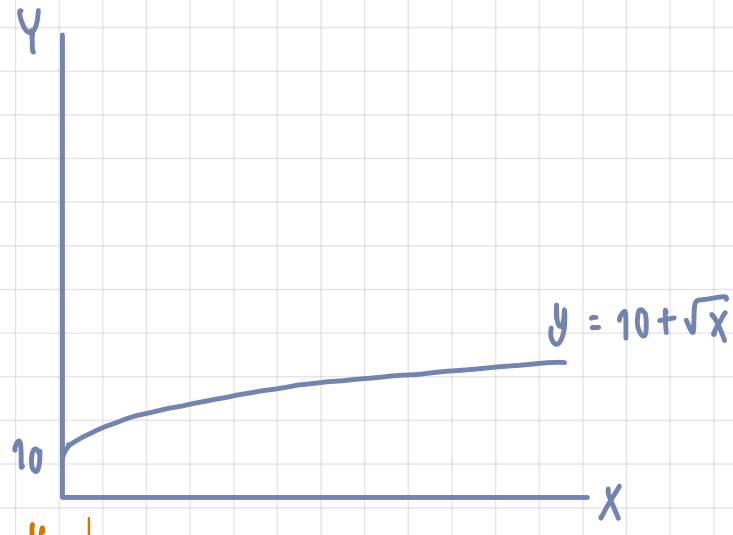
$\frac{d}{dx}\left(\frac{dy}{dx}\right) = \frac{1}{2\sqrt{x}} \cdot \frac{d}{dx}$

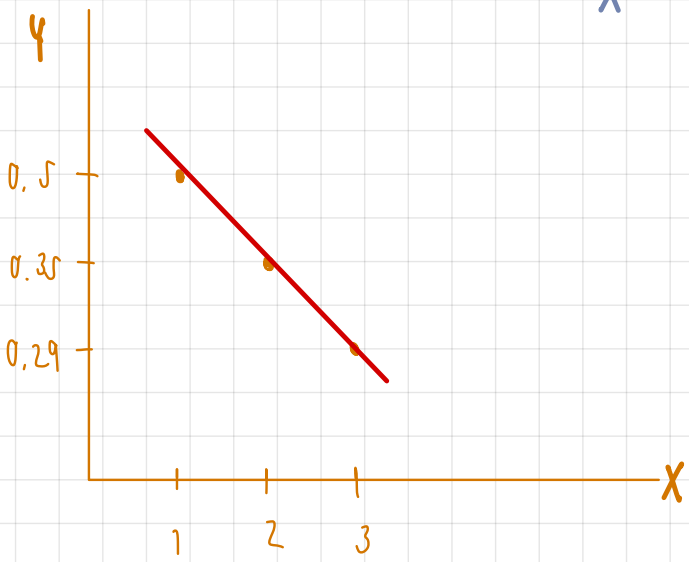
Ans. $\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right)$

$y' = \frac{1}{2}x^{-\frac{1}{2}}$

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

$y'' = \frac{1}{2x\sqrt{x}}$





∴ slope is not constant