

HW #1 Due Tuesday 25 August 2020

H.W. $y = 10 + \sqrt{x}$

x	y	dy/dx
0		
1		
2		
3		

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.

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?

Answer

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① $y = 10 + \sqrt{x}$

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

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

X	y	dy/dx
0	10	0
1	11	1/2
2	$10+\sqrt{2}$	$\frac{1}{2\sqrt{2}}, 0.35$
3	$10+\sqrt{3}$	$\frac{1}{2\sqrt{3}}, 0.28$

• as $x=2, \Delta x = 0.1$

x is increasing to 2.1 ↑

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

$\Delta y = 0.35(0.1) = 0.035$ #

Real change in y is $x=2.1, y=10+\sqrt{2.1}=11.45$

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

error 0.005 #

• as $x=2, \Delta x = -0.2$

x is decreasing to 1.8 ↓

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

$\Delta y = 0.35(-0.2) = -0.07$ #

Real change in y is $x=1.8, y=10+\sqrt{1.8}$

$= 11.34$

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

error 0 *

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② find 2nd order derivative of $y = 10 + \sqrt{x}$

$$f(x)' = \frac{1}{2}x^{-1/2}$$

$$f(x)'' = -\frac{1}{4}x^{-3/2}$$

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

$$x=10, y=10$$

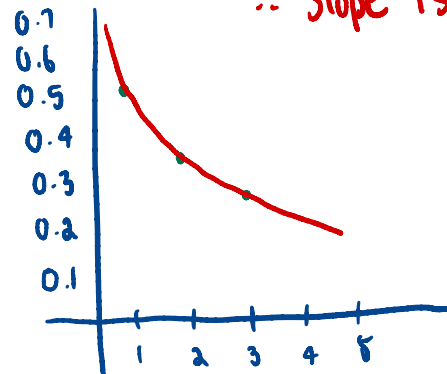
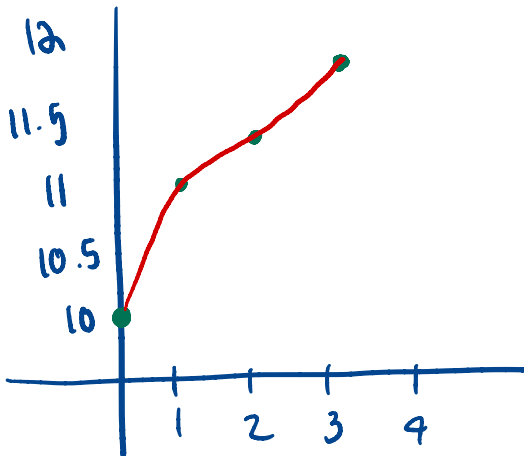
$$10 = 10 + \sqrt{0}$$

$$x=0 \text{ undefined.}$$

$$x=1, y=11$$

$$11 = 10 + \sqrt{x} \quad x^{1/2}$$

$$f'(x) = \frac{1}{2}, 0.5$$



$\therefore$ slope is not a constant.

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