

HW#2 Due Jan 20, 2022

HW Given $y = 10 + \sqrt{x}$,

- Find the derivative $f'(x)$.
- Fill in the table

Point	X	Y	$f'(x)$
	0	10	
A	1	11	0.5
B	2	11.414	0.36
C	3	11.732	0.29

- Does the slope increase as x increases?
- Approximate the change in Y when $\Delta x = 0.2$ at $x_1 = 3$. Is the approximation under- or over-estimate?

$$a) f'(x) = \frac{dy}{dx} = x^{\frac{1}{2}} = \frac{1}{2} \cdot x^{\frac{1}{2} - 1} = \frac{1}{2} \cdot x^{-\frac{1}{2}} = \frac{1}{2} \cdot \frac{1}{x^{\frac{1}{2}}} = \frac{1}{2} \cdot \frac{1}{\sqrt{x}} = \frac{1}{2\sqrt{x}}$$

c) No

d) $\Delta Y = ?$ when $\Delta X = 0.2$, $X_1 = 3$

$$\begin{aligned} X_2 &= X_1 + \Delta X \\ &= 3 + 0.2 \\ &= 3.2 \end{aligned}$$

$$\begin{aligned} \text{Approximate: } \Delta Y &= f'(x_1) \cdot \Delta X \\ &= f'(3) \cdot 0.2 \\ &= \frac{1}{2\sqrt{3}} \cdot 0.2 \\ &= 0.0577 \end{aligned}$$

∴ It is overestimate

$$\begin{aligned} \text{real: } Y_2 &= f(x_2) = 10 + \sqrt{x_2} \\ &= 10 + \sqrt{3.2} \\ &= 11.7889 \\ \Delta Y &= Y_2 - Y_1 \\ &= 11.7889 - 11.732 \\ &= 0.0569 \end{aligned}$$