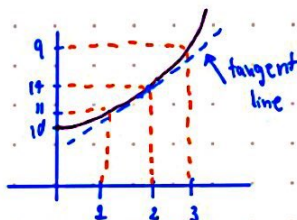


Nonlinear

line:
 $y = 10 + x^2$

x	y	$\frac{dy}{dx}$
0	10	0
1	11	2
2	14	4
3	19	6



slope at a point $x=2$
= slope of tangent line
touching the graph at
 $x=2$

→ as y increasing, the slope is increasing

→ when $x=2, y=14$ (slope 4)

$\Delta x = 0.1$ — x increasing from 2 to 2.1

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

$= 4 \times (0.1) = 0.4$

What is the real change in y ?

$x = 2.1, y = 10 + (2.1)^2 = 14.41$

$\therefore \Delta y = 14.41 - 14 = 0.41$

not exactly
same bc
it's not linear

H.W. $y = 10 + \sqrt{x}$ find $\frac{dy}{dx}$ Approximate Δy when $x=2, \Delta x=0.1$
 $\Delta x = -0.2$ compare the actual Δy to find the errors.

x	y	$\frac{dy}{dx}$
0	10	0
1	11	0.5
2	11.41421	0.35
3	11.73205	0.29

$\frac{dy}{dx} = \frac{1}{2} x^{-\frac{1}{2}}$

① As $x=2, \Delta x=0.1$

$x' = 2.1$

$\frac{1}{2} (2.1)^{-\frac{1}{2}} = 0.345$

$\frac{\Delta y}{\Delta x} = 0.345$

$\frac{\Delta y}{0.1} = 0.345$

$\Delta y = 0.0345$

actual Δy

$y' = 10 + \sqrt{2.1}$

≈ 11.45

$y' - y = 11.45 - 11.41 = 0.04$

actual $\Delta y - \Delta y$

$0.04 - 0.0345 = 0.0055$

$\therefore \text{error} = 0.0055$

② $x=2, \Delta x = -0.2$

$x' = 1.8$

$\frac{1}{2} (1.8)^{-\frac{1}{2}} = 0.37$

$\frac{\Delta y}{\Delta x} = 0.37$

$\frac{\Delta y}{-0.2} = 0.37$

≈ -0.074

actual Δy

$y' = 10 + \sqrt{1.8}$

$= 11.34$

$y' - y = 11.34 - 11.41$

$= -0.07$

actual $\Delta y - \Delta y$

$-0.07 - (-0.074) = 0.004$

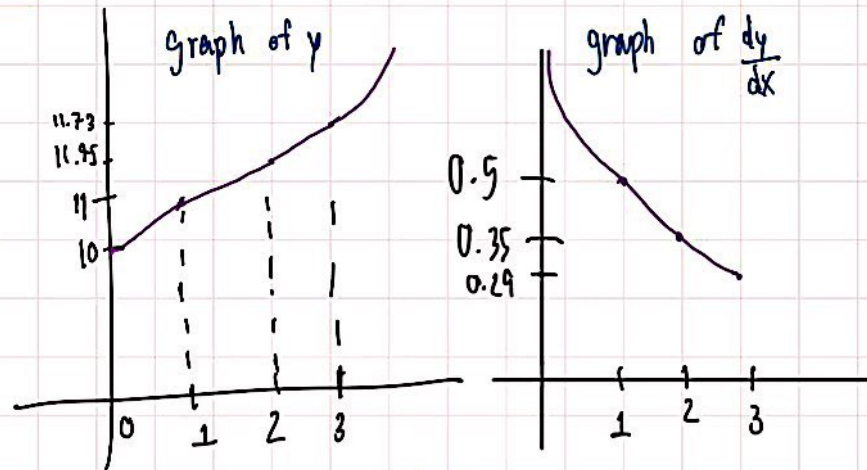
$\therefore \text{error} = 0.004$

(HW) 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	$\frac{dy}{dx}$	$\frac{d^2y}{dx^2}$
0	10	UND	UND
1	11	0.5	$-\frac{1}{4}$
2	11.41	0.35	$-\frac{\sqrt{2}}{16}$
3	11.73	0.29	$-\frac{\sqrt{3}}{36}$

$$\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}}$$

$$\frac{d^2y}{dx^2} = -\frac{1}{4}x^{-\frac{3}{2}}$$



$\therefore$ slope is not a constant.

Production Possibility Curve (PPC)

A given economy has a certain amount of resource (land, labor, what can the economy produce at the most efficient possible capital/way

Assumptions

- 1) the economy can produce 2 products ($x \neq y$)
- 2) limited resource (land, labor, capital)
- 3) Full employment
- 4) Full Efficiency - no waste, using the best technology available
- 5) Fixed Technology