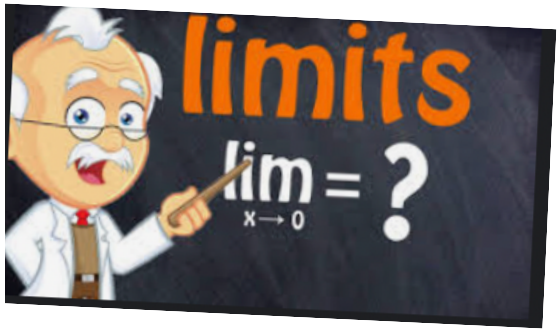
Get ready for unit 2:

Limits and Continuity



01 A Brief Preview of Calculus

02 The Concept of Limit

03 Computation of Limits

04 Continuity and Its Consequences

05 Limits Involving Infinity; Asymptotes

The only way to learn mathematics is to do mathematics.

Wishing you all the best ☺

SENIOR
class of 2023

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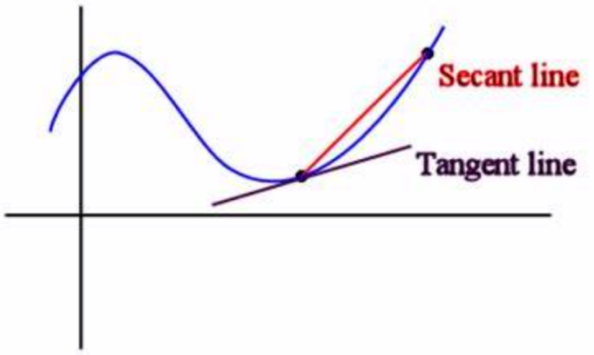
Lesson 1 : Tangent lines and the length of curve .



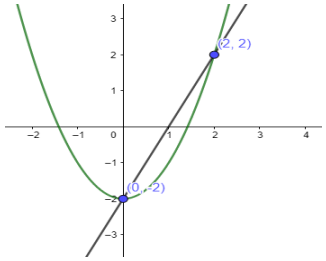
Secant line: a line that intersects two points on a curve.

Tangent line: a line that touches a curve at only one point.

The slope of the secant line:

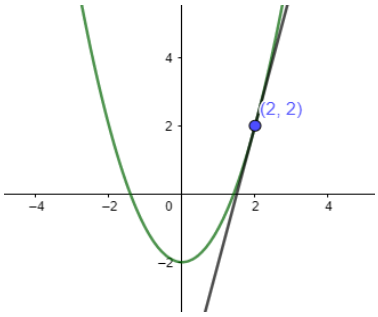
The slope of the line **through two points** $A\ (x_1\ , f(x_1\ )\ and\ B\ (x_2\ , f(x_2\ )$ is:

$$m_{sec} = \frac{f(x_2) - f(x_1)}{x_2 - x_1}$$



Slope of the curve at a given point:

Slope of the tangent at a point is:
the instantaneous rate of change of the function at that point.



Exercises page 67: estimate the slope of $y = f(x)$ at $x = a$.

Q2 $f(x) = x^3 + 2, when\ x = 2$

Point	2nd point	$m_{sec} = \frac{y_2 - y_1}{x_2 - x_1}$
(2 , …)		

Point	2nd point	$m_{sec} = \frac{y_2 - y_1}{x_2 - x_1}$
(2 , …)		

Note:

Q4 $f(x) = \sqrt{x+1}\ when\ x = 0$

Point	2nd point	$m_{sec} = \frac{y_2 - y_1}{x_2 - x_1}$
(0 , …)		

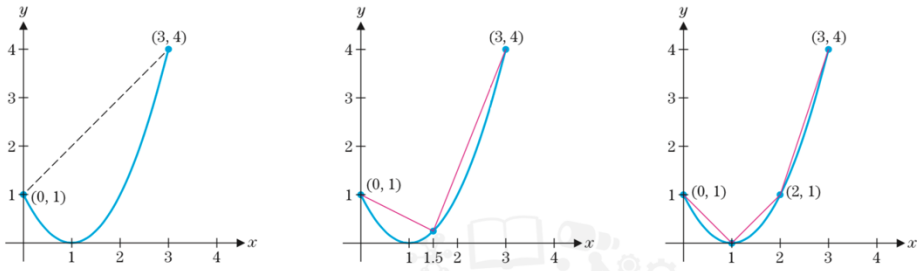
Point	2nd point	$m_{sec} = \frac{y_2 - y_1}{x_2 - x_1}$
(0 , …)		

Q6 $f(x) = \ln x\ \ when\ x = 1$

Point	2nd point	$m_{sec} = \frac{y_2 - y_1}{x_2 - x_1}$
(1 , …)		

Point	2nd point	$m_{sec} = \frac{y_2 - y_1}{x_2 - x_1}$
(1 , …)		

Arc Length:



The arc length of a function on a given interval can be approximated by:

1. finding linear distances between points that have evenly spaced x-coordinates

$$\boldsymbol{d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}}$$

2. Then find the sum of the lengths of the segments.

Note **The more line segments you use the better approximation you will get for the arc length.**

Exercise page 68: estimate the length of the curve $y = f(x)$ *on the given interval using* $n = 4$ *line segments.*

$Q8: f(x) = sinx\ , 0 \le x \le \pi/2$

$$\Delta x = \frac{b-a}{n} = \frac{\dots\dots\dots}{\dots\dots\dots}$$

Left	Right	$\boldsymbol{d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}}$
(0,)	$(\frac{\pi}{8}$,)	
Arc Length≈		

Ans: 1.906

Exercise page 68 : estimate the length of the curve $yf(x)$ *on the given interval using* $n = 4$ *line segments*

$Q10: f(x) = {}^{1}/_{x}\ , 1 \le x \le 2$

$$\Delta x = \frac{b-a}{n} = \frac{\dots\dots\dots}{\dots\dots\dots}$$

Left	Right	$\boldsymbol{d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}}$
Arc Length≈		

Ans: 1.1310

Exercise page 68 : estimate the length of the curve $yf(x)$ *on the given interval using* $n = 4$ *line segments*

$Q12: f(x) = x^3 + 2\ , -1 \le x \le 1$

$$\Delta x = \frac{b-a}{n} = \frac{\dots\dots\dots}{\dots\dots\dots}$$

Left	Right	$\boldsymbol{d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}}$
Arc Length≈		

Ans: 3.0463

Homework of Lesson 1

Example 1 page 5:

Estimate the slope of $y = x^2 + 1$ at $x = 1$

$Ans: 2$

Example 2 page 6:

Estimate the slope of $y = \sin x$ at $x = 0$

$Ans: 1$

Example 3 page 6:

Estimate the arc length of the curve $y = \sin x$ for $0 \leq x \leq \pi$.

$Ans: 3.8$

https://forms.office.com/r/zcLRWGQdWq