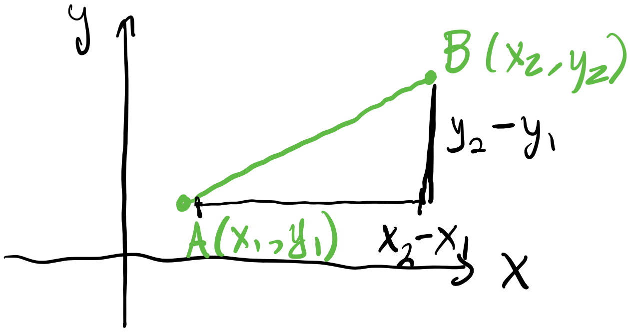
Slope of a Line Segment



The <u>slope</u> of $\overline{AB}$ is defined to be $\dfrac{y_2 - y_1}{x_2 - x_1}$

$= \dfrac{\text{change in y-coord}}{\text{change in x-coord.}}$

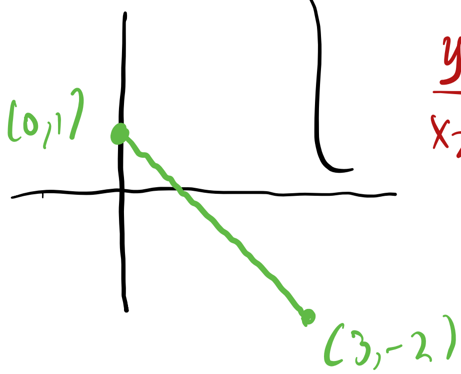
<u>Ex:</u> Slope of line segment between $(0,1)$ and $(3,-2)$?

$(0,1)$: (x_1, y_1) (x_2, y_2)

$(3,-2)$: (x_2, y_2) (x_1, y_1)

slope is $\dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{-2-1}{3-0} = \dfrac{-3}{3} = \boxed{-1}$

$\dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{1-(-2)}{0-3} = \dfrac{3}{-3} = \boxed{-1}$



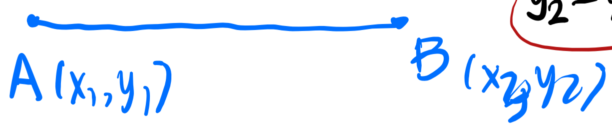
Facts about slope:

1) The slope of a line segment does not depend on the order that the

points we named in.

2) The slope of a horizontal line segment is 0.

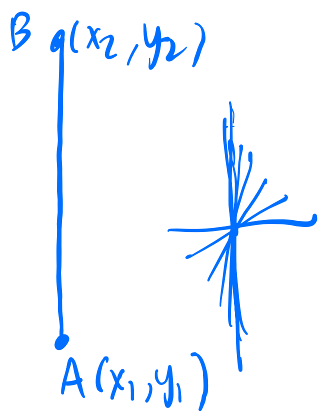
$y_2 = y_1$



$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{0}{x_2 - x_1} = 0$$

3) The slope of a vertical line segment is undefined.

$x_2 = x_1$



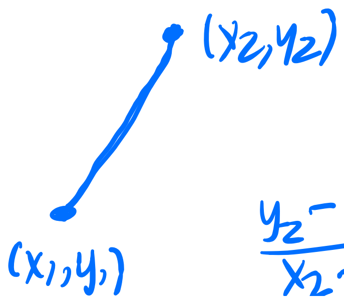
$$\frac{y_2 - y_1}{x_2 - x_1}$$ is undefined

since $x_2 = x_1$

$x_2 - x_1 = 0$

0

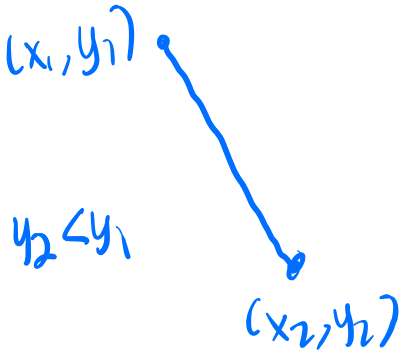
4) The slope of a segment that rises (resp. descends) from left to right is positive (resp. negative)



$x_2 - x_1 > 0$

$y_2 - y_1 > 0$

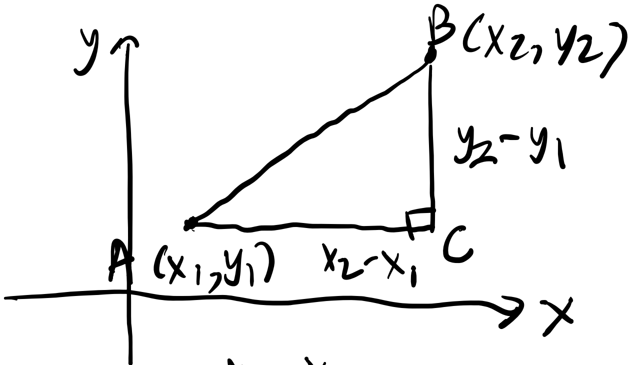
$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{+}{+} > 0$$



$x_2 - x_1 > 0$

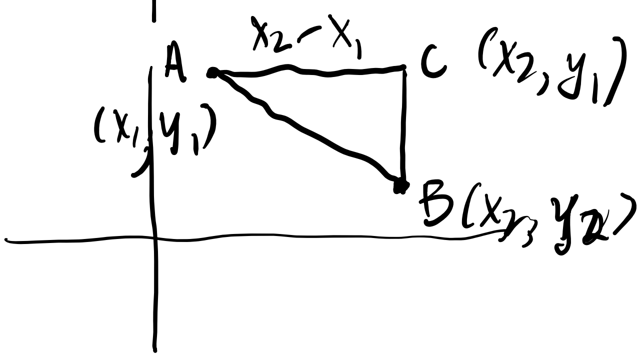
$y_2 - y_1 < 0$

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-}{+} < 0$$



If $\overline{AB}$ has positive slope,

$$\text{slope} = \frac{BC}{AC}$$



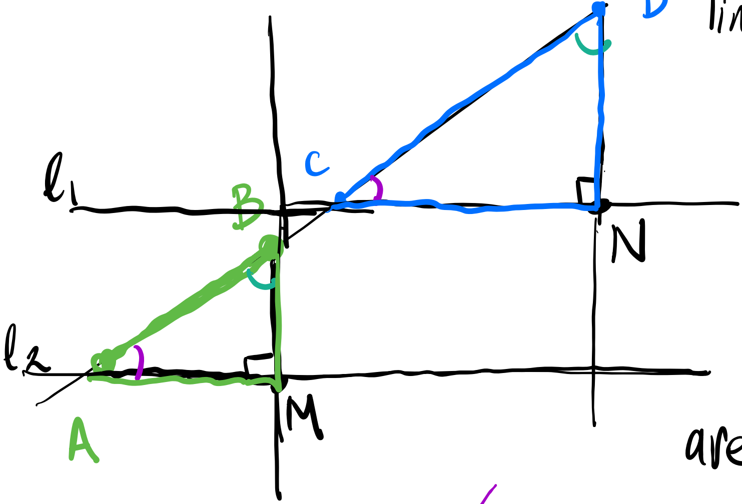
change in y is $y_2 - y_1$

but

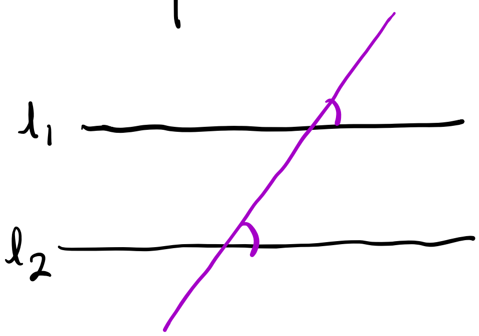
BC has length $y_1 - y_2$

$$\text{so} \quad \text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = -\frac{BC}{AC}$$

<u>Theorem:</u> All line segments on a nonvertical line have the same slope.

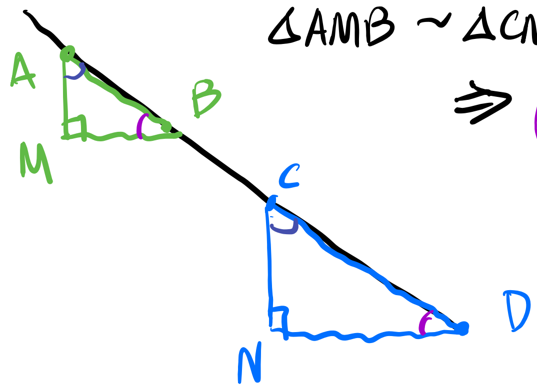


Right triangles ΔAMB and ΔCND are similar.



So $\dfrac{DN}{CN} = \dfrac{BM}{AM}$

slope of $\overline{CD}$ slope of $\overline{AB}$



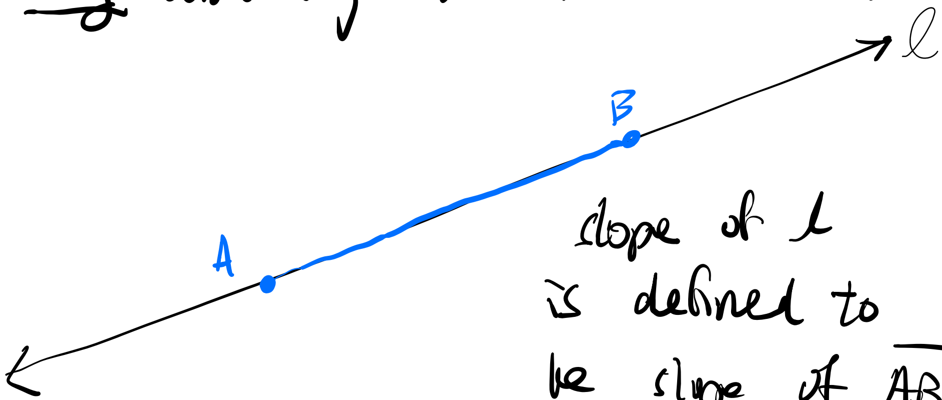
$\Delta AMB \sim \Delta CND$

$\Rightarrow \dfrac{AM}{MB} = \dfrac{CN}{ND}$

- slope of $\overline{AB}$ - slope of $\overline{CD}$

$\Rightarrow$ slope of $\overline{AB}$ is equal to slope of $\overline{CD}$.

The slope of a line is the slope of any line segment on the line.



slope of ℓ
is defined to
be slope of $\overline{AB}$.