What is the difference between each of the ski slopes below?
(Each drops 100 vertical feet)

Widow Maker

Fun In The Sun

Bunny Delight
Slope is the ratio of vertical change over horizontal change.

\[
\text{slope} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{\text{rise}}{\text{run}}
\]

\[
m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{where } x_1 \neq x_2
\]

Ex 1) Find the slope of the line containing the points \((-1, 5)\) and \((3, -7)\).

\[
m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-7 - 5}{3 + 1} = \frac{-12}{4} = -3
\]

**Theorem**

The slope of the line \(Ax + By = C\) is \(\frac{-A}{B}\) \((B \neq 0)\)
Ex 2) Find the slope of the line $3x - 4y = 20$

\[ A = 3 \quad B = -4 \]

\[ -\frac{A}{B} = -\frac{3}{-4} = \frac{3}{4} \]

The slope of a horizontal line ($By = C$) is zero (0)
The slope of a vertical line ($Ax = C$) is "no slope" or "undefined".

Mr. Clausen prefers the term "undefined" for vertical lines since the definition of a rational number is not defined when 0 (zero) is in the denominator.
Think of skiing... on a horizontal line you will travel 0 (zero) distance, so the slope is 0 (zero).

"Clausen-ism" Alert!
When you ski a vertical line your body parts are hard to find, therefore, the slope is undefined.
Ex 3) Graph the line through the point (-3, 5) having a slope of $m= -\frac{1}{2}$.

Slope Intercept Form of an Equation:
$y = mx + b$
m is the slope, b is the y-intercept.
Ex 4) Graph $3x + 4y = 12$

$\frac{4y}{4} = \frac{-3x + 12}{4}$

$y = -\frac{3}{4}x + 3$

$b = 3$, $m = -\frac{3}{4}$

[Diagram of a graph with a line graphed through the points $(0, 3)$ and $(4, 0)$, showing the intersection with the y-intercept at $y = 3$ and the slope $m = -\frac{3}{4}$]