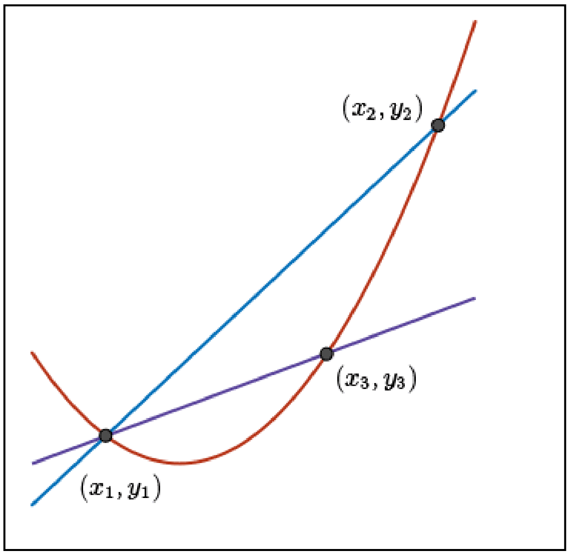
Calculating Rate of Change

A **rate of change** is a measure of the change in the dependent variable, Δy, with respect to a change in the independent variable, Δx. When we calculate the slope of a line segment, we are calculating the rate of change of y with respect to x.

We are interested in examining two types of rates of change.
The first is **average rate of change** which is measured over_________________.
The second **is instantaneous rate of change** which is measured_______________________.

Secants

A **secant** is a line which passes through a curve in at least two distinct points.
More than one secant can be drawn through a point on a curve.
A secant through a single point is not unique.
The **slope of the secant** between two points represents the **average rate of change** and can be found as follows:

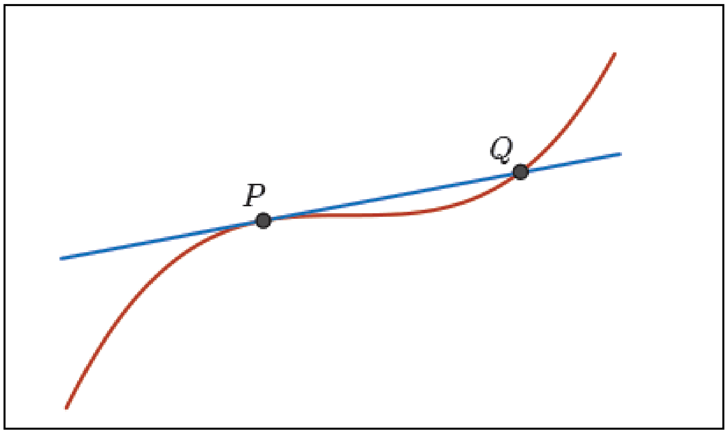


The **slope of the secant** between two points represents the **average rate of change** and can be found as follows:

m_{secant} =

Tangents

A **tangent** is a line which touches a curve at a point.
The point is called a point of tangency. At the point of tangency, the tangent (line) does not cross the curve but it may or may not cross the curve at some other point.
On the diagram, the line is tangent to the curve at point P and crosses the curve at point Q.
The line is not tangent to the curve at point Q.



The **slope of the tangent** to a specific point on the curve represents the **instantaneous rate of change of the curve at that point**.

Rates of Change for Linear Functions

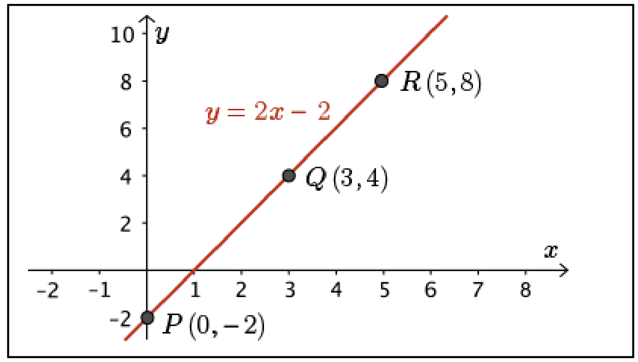
Consider the linear function $y=2x-2$.

A graph of $y=2x-2$ is shown with three specific points $P(0,-2)$, $Q(3,4)$, and $R(5,8)$ also plotted on the graph.

m_{PQ} =

m_{PR} =

m_{QR} =



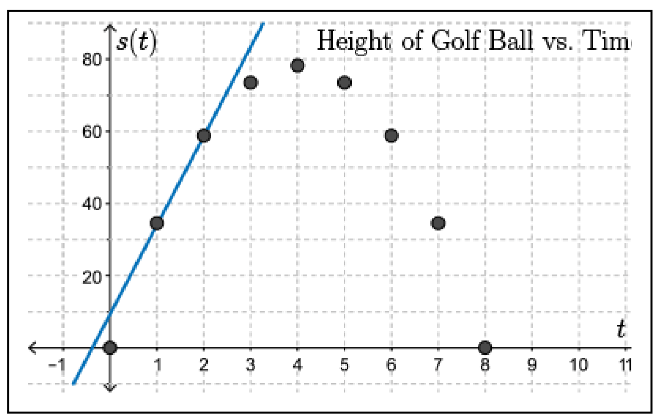
Conclusion: the average rate of change for any two points on a linear function is constant.

Golf Anyone?

On a distance-time graph, the slope of the secant (or average rate of change) represents the average velocity.

m_{secant}=

Time t (seconds)	Height s (metres)
0	0
1	34.3
2	58.8
3	73.5
4	78.4
5	73.5
6	58.8
7	34.3
8	0



1) Calculate the average rate of change for $t \in [1,2]$

2) Calculate the average rate of change for $t \in [2,3]$