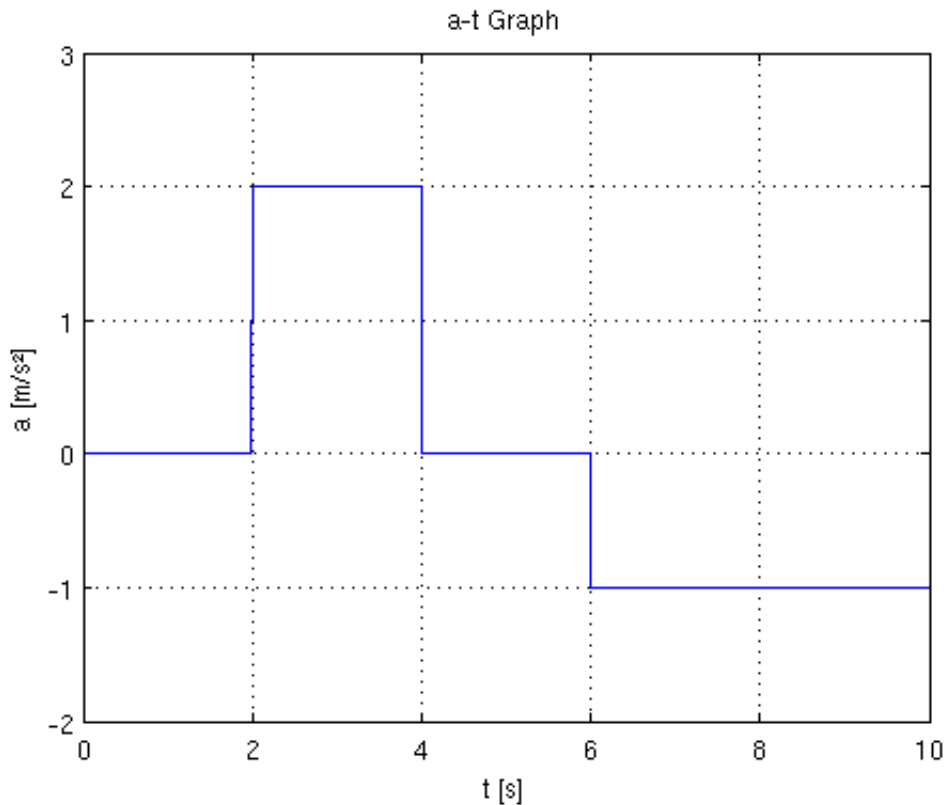


## 1D-Kinematics: a-t Graphs

Acceleration is the change of velocity over time  $a_{av} = \frac{\Delta v}{\Delta t}$ . Eq1

An a-t graph plots the acceleration (a) of an object as a function of time (t). The x-axis represents the time, the y-axis represents the acceleration of an object at each moment.

In the example below, an object has no acceleration between  $t=0$ s and 2s as well as between  $t=4$ s and 6s. Between  $t=2$ s and 4s, the acceleration is  $2\text{m/s}^2$ , meaning the object is increasing its velocity. Between  $t=6$ s and 10s, the acceleration is  $-1\text{m/s}^2$ , meaning the object is decreasing its velocity.



### Tasks

1. Solve Eq1 for  $\Delta v$
2. Between  $t=2$ s and  $t=4$ s, how much did the velocity change ( $\Delta v = ?$ )
3. Between  $t=6$ s and  $t=10$ s, how much did the velocity change ( $\Delta v = ?$ )
4. The change in velocity since  $t=0$  at each moment is equal to the area under the a-t curve from  $t=0$  to the time at which we want to know the velocity. Does this match with the formula you found to calculate  $\Delta v$  ?
5. Assuming  $v(t=0)=0$ , draw a v-t (velocity-time) graph with time on the x-axis and v on the y-axis. Don't forget the units!