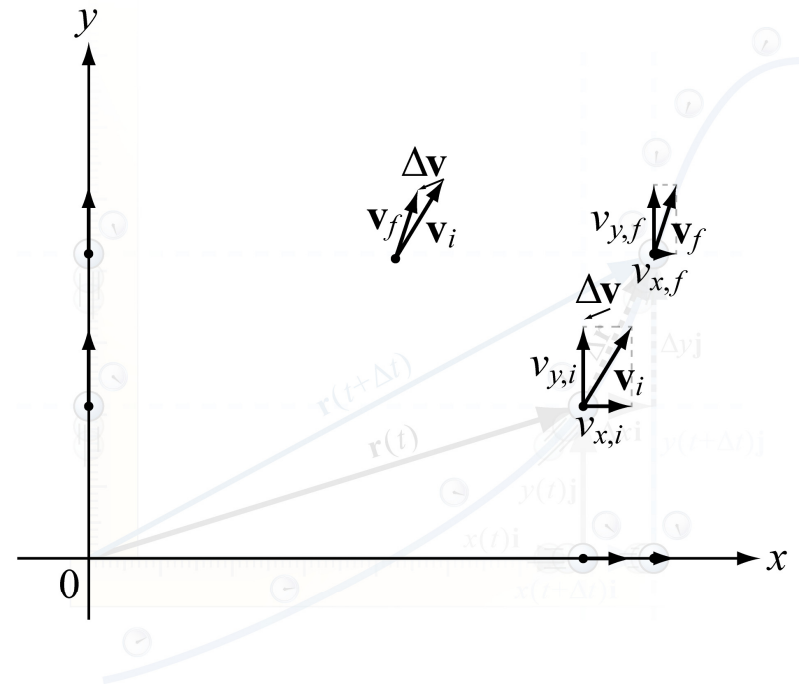
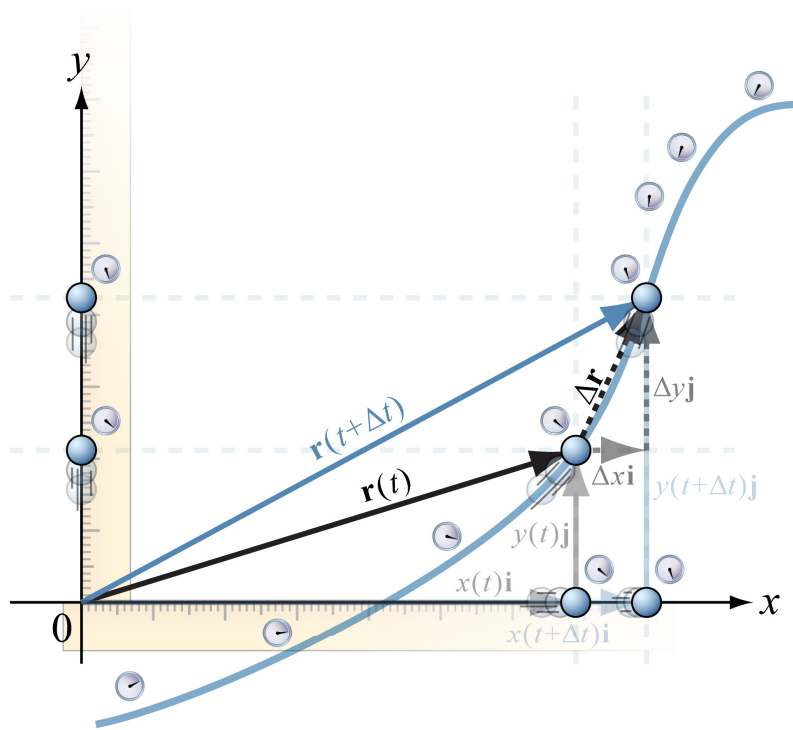


## Resolve multi-dimensional motion into 1-d components

The motion of an object in two dimensions can be directly analyzed by drawing a motion diagram illustrating velocity vectors with magnitudes and directions drawn to scale.



The motion of an object in two dimensions can also be re-expressed in terms of two 1-d descriptions.

An object moving in multiple dimensions casts “shadows” on the coordinate axes. The shadows undergo simultaneous 1-d motion. The time values that label the actual positions visited by the object in multi-dimensional space are the same time values that label the corresponding shadows on the coordinate axes.

When studying kinematics in multiple dimensions, one-dimensional kinematics relationships can be applied separately to the  $x$  coordinate, the  $y$  coordinate, etc.

The definition of speed introduced in the reference sheet for 1-d motion can be extended to motion in multiple dimensions.

$$\text{speed} := |\vec{v}|$$