

11.3: Law of Addition of Velocities - Newtonian Mechanics

Suppose the object in Figure 11.1 is moving; then observers in different reference frames will measure different velocities. Denote the velocity of the object in frame S by $\vec{v} = d\vec{r}/dt$, and the velocity of the object in frame S' by $\vec{v}' = d\vec{r}'/dt'$. Since the derivative of the position is velocity, the velocities of the object in two different reference frames are related according to

$$\frac{d\vec{r}'}{dt'} = \frac{d\vec{r}}{dt} - \frac{d\vec{R}}{dt}$$
$$\vec{v}' = \vec{v} - \vec{V}$$

This is called the **Law of Addition of Velocities**.

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