

11.4: Summary

Let's summarize the results so far for two- and three-dimensional kinematics:

Always True

These equations are definitions, and are always true:

$$\mathbf{v} = \frac{d\mathbf{r}}{dt} \Rightarrow \mathbf{r}(t) = \int \mathbf{v}(t) dt \quad (11.4.1)$$

$$\mathbf{a} = \frac{d\mathbf{v}}{dt} = \frac{d^2\mathbf{r}}{dt^2} \Rightarrow \mathbf{v}(t) = \int \mathbf{a}(t) dt \quad (11.4.2)$$

Constant Acceleration

These equations are valid only for constant acceleration \mathbf{a} :

$$\mathbf{r}(t) = \frac{1}{2}\mathbf{a}t^2 + \mathbf{v}_0t + \mathbf{r}_0 \quad (11.4.3)$$

$$\mathbf{v}(t) = \mathbf{a}t + \mathbf{v}_0 \quad (11.4.4)$$

$$v^2 = v_0^2 + 2\mathbf{a} \cdot (\mathbf{r} - \mathbf{r}_0) \quad (11.4.5)$$

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