

Kinematics

Memorize these:

Can only be used with constant acceleration

$$\left\{ \begin{array}{l} x = x_0 + v_0 t + \frac{1}{2} a t^2 \\ v = v_0 + a t \\ v^2 = v_0^2 + 2a \Delta x \end{array} \right.$$

→ * If I move with constant speed for 2sec then start to accelerate, I don't have constant acceleration the whole time.

Free Fall

$$y = y_0 + v_{0y} t + \frac{1}{2} g t^2$$

$$v_y = v_{0y} + g t$$


$$v_y^2 = v_{0y}^2 + 2a \Delta y$$

* If you are above zero, you have $+\Delta y$, below zero you have $-\Delta y$.

* You can set where zero is, whatever is convenient for the problem. — just be consistent.

Remember:

- Velocity at the top is zero.
- Acceleration is never zero.



Derivatives

$$x(t) = A t^n$$

$$v(t) = \frac{dx(t)}{dt} = n A t^{n-1}$$

$$a(t) = \frac{dv(t)}{dt} = \frac{d^2 x(t)}{dt^2}$$

Ex. $x(t) = 6t^2 + 3t - 1$
 $v(t) = 12t + 3$
 $a(t) = 12$

} equations of motion

* Evaluate a t , time to solve for instantaneous values.