$$y = x^2$$

$$\frac{dy}{dx} = 2x$$

$$\frac{dv}{dt} = a = -g$$

$$v = at + v_0 = -gt + v_0$$

$$\frac{dy}{dt} = v = -gt + v_0$$

$$y = -\frac{1}{2}gt^2 + v_0 t + y_0$$

$$\frac{dv}{dt} = -g + Kv^2$$

$$\frac{d^2y}{dt^2} = \frac{dv}{dt} = a = -g = -9.8 \text{ m/s}^2$$

$$v(t) = v_0 - gt$$

$$v(t) = 0 - gt$$

$$y(t) = y_0 + v_0 t - \frac{1}{2}gt^2$$

$$y(t) = H - \frac{1}{2}gt^2$$

$$\frac{dv}{dt} = -g$$

$$v(t) = v(t_0) + v'(t - t_0) + \frac{1}{2}v''(t - t_0)^2 + \ldots$$

$$v(t) = v(t_0) + v'(t - t_0)$$

$$v_{i+1} = v_i + v_i'(t_{i+1} - t_i)$$

$$dt = t_{i+1} - t$$

$$v' = \frac{dv}{dt} = -g$$

$$v'' = \frac{d^2v}{dt^2} = 0$$

$$v(t) = v(t_0) + (-g)(t - t_0) + 0 + 0 \ldots$$

$$v(t) = v(t_0) + (-g)(t - t_0)$$

$$v_{i+1} = v_i + (-g)(t_{i+1} - t_i)$$

$$y(t) = y(t_0) + y'(t - t_0) + \frac{1}{2}y''(t - t_0)^2 + \ldots$$

$$\begin{aligned} y' &= v \\ y'' &= a = -g \\ y''' &= 0 \end{aligned}$$

$$y_{i+1} = y_i + v(t_{i+1} - t_i)$$

$$\text{error} = \frac{1}{2}g(t_{i+1} - t_i)^2$$

$$y_{i+1} = y_i + v(t_{i+1} - t_i) - \frac{1}{2}g(t_{i+1} - t_i)^2$$