Equations of Motion

- **Equation of Motion** gives position of a particle as a function of time.
- Motion with constant velocity is called ***uniform.*** **Equations of Uniform Motion in 1D**:

$$a(t) = 0$$
$$v(t) = v_0$$
$$x(t) = x_0 + v_0 t$$

Here $x_0 = x(0)$ and $v_0 = \mathrm{v}(0)$ are coordinate x and velocity v at time $t = 0$.

- Equations of **Constant-Acceleration Motion in 1D**:

$$a(t) = a$$
$$v(t) = v_0 + at$$
$$x(t) = x_0 + v_0 t + \frac{at^2}{2}$$

HOMEWORK

You are visiting an unknown planet, and discover a tower built by an ancient alien civilization. You decide to measure the gravitational acceleration on that planet by doing the experiment that we did in class. Two photogates are used: Gate 1 is placed on the top of the tower, and Gate 2 at its bottom. At the initial moment, you place a rock so that it blocks the Gate 1. The rock size is size 10 cm. You release it with no initial speed and record the signal from both gates. Below are the results of your experiment:

GATE #	t_1 ,s (gate blocked)	t_2 ,s (gate unblocked)
Gate 1	N/A	0.000
Gate 2	4.030	4.035

a) From this data, find the gravitational acceleration.
b) What is the height of the tower?