

Take out work

Answer notes that follow:

Make index card

Work on Rolling Lab... 2 class days to do

Make sure you've handed in Interactive Physics Sims 1-4

HW tonite: pg 49, 53 to go over..., then pg 55, 58

NOW THAT WE KNOW OUR DEFINITIONS

DISTANCE = average VELOCITY \* TIME

Average VELOCITY is the middle of the INITIAL and FINAL VELOCITY

ACCELERATION is the CHANGE in VELOCITY over TIME.

$$D = V_{avg} * T$$

$$V_{avg} = (V_i + V_f) / 2$$

$$A = (V_f - V_i) / T \text{ or } V_f = V_i + A * T \text{ to make it easier...}$$

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Find:

What if we know  $V_i$ ,  $A$ ,  $T$  but don't know  $V_f$  and want the distance? (Like interactive physics when you know all the starting values, but not how the journey is going to end?)

Find the equation for this..... what does it look like on a D-T graph?

$$D = f(V_i, A, T)$$

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What if you know nothing about time, but want the final velocity or distance?

$$V_f = f(V_i, A, D)$$

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Find the equation for this.... what does it look like on a D-T graph?

$$D = f(V_i, A, T)$$

$$D = (V_i + V_f) / 2 * T \quad V_f = V_i + A * T$$

$$D = (V_i + (V_i + A * T)) / 2 * T$$

$$D = (2V_i + A * T) / 2 * T$$

$$D = 2V_i / 2 * T + A * T / 2 * T$$

$$D = V_i * T + \frac{1}{2} * A * T^2$$

*This is a parabola!!! Just like a D-T graph with constant acceleration!*

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What if you know nothing about time, but want the final velocity or distance?

$V_f = f(V_i, A, D)$

$$D = (V_i + V_f) / 2 * T$$

$$V_f = V_i + A * T$$

$$T = 2D / (V_i + V_f)$$

$$T = (V_f - V_i) / A$$

$$2D / (V_i + V_f) = (V_f - V_i) / A \quad \text{cross multiply to get}$$

$$2AD = (V_i + V_f) * (V_f - V_i)$$

$$2AD = V_f^2 - V_i^2$$

$$\text{or } V_f^2 = V_i^2 + 2 * A * D \quad \text{no time...}$$

**SO OUR INDEX CARD OF FORMULAS IS:**

1)  $D = V_{avg} T$        $D = \frac{(V_i + V_f)}{2} T$       *no A*

2)  $V_{avg} = \frac{(V_i + V_f)}{2}$

3)  $A = \frac{(V_f - V_i)}{T}$  or easier  $V_f = V_i + AT$       *no D*

4)  $D = V_i T + \frac{1}{2} A T^2$       *no V\_f*

5)  $V_f^2 = V_i^2 + 2AD$       *no T*

*(note, these only work for a period of constant acceleration)*

*D = Change in displacement, V<sub>i</sub> = initial velocity, V<sub>f</sub> = final velocity,  
A = Acceleration, T = Change in Time*