Part I: Newton’s Laws
Chapter 2: Kinematics in One Dimension

2.4 Motion with Constant Acceleration
→ $v_x(t)$ for the SPECIAL CASE of constant acceleration.

The use of a **definite** integral helps us tell a clear story, track a process:

(initial **state** “i”) → (final state “f”)

1. $a_x = \frac{dv_x}{dt}$
2. $dv_x = a_x \, dt$;
3. $\int_{i}^{f} dv_x = \int_{i}^{f} a_x \, dt$;
4. $(a_x$ =constant) → $\int_{i}^{f} dv_x = a_x \int_{i}^{f} dt$;
5. $v_{fx} - v_{ix} = a_x (t_f - t_i)$
6. $v_x = v_{0x} + a_x t \quad \text{For constant } a_x \text{ only!!!!!}$
$\rightarrow x(t)$ for the SPECIAL CASE of constant acceleration.

The use of a **definite** integral helps us tell a clear story, track a process:

(initial state “i”) $\rightarrow$ (final state “f”)

1. $v_x = \frac{dx}{dt}$

For you to do: Walk this trail, mirroring the thinking and process we used to find $x(t)$. 
A trio of equations as a set for the SPECIAL CASE of constant acceleration.

You need **GREEN LIGHT** language:

Have you identified that the acceleration is a constant????? If so.....

1. \( v_x = v_{0x} + a_x t \)
2. \( x = x_0 + v_{0x} t + \frac{1}{2} a_x t^2 \)
3. \( v_x^2 = v_{0x}^2 + 2a_x(x - x_0) \)
Example problem: You are parked on the side of the road in your blue car. A green motorcycle zips by going a constant 40.0 m/s. At this instant, you step on the gas to maintain a constant acceleration of 10.0 m/s$^2$ .....*

*Design your own questions!* Finish walking the trail, run out the calculations.