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# Optional Problems for One-Dimensional Motion 

## OPTIONAL FOR A STICKER

You must use the GUE and show all of your work.

PROBLEM 1: You are driving in your car at $35 \mathrm{~m} / \mathrm{s}$ and come to a stop in 4.55 sec . How many meters did it take you to stop? ( $\approx 79.5 \mathrm{~m}$ )

PROBLEM 2: You are standing on top of a 22.5 m tall cliff. If you reach over and throw a rock straight up and it takes 2.35 sec to reach its peak, how fast will it be traveling when it lands at the bottom of the cliff in miles per hour? ( 69.7 mph )

PROBLEM 3: A volley ball is thrown vertically upward at $25 \mathrm{~m} / \mathrm{s}$ from a height of 8 meters.
a. How long does it take the volley ball to reach its highest point? ( $\approx 2.55 \mathrm{sec}$.)
b. How long does it take the volley ball to hit the ground from the time it was thrown until the time it hits? ( $\approx 5.4 \mathrm{sec}$.)

## PROBLEM 4:

A cell phone is dropped by a climber who is descending at a constant speed of $1.3 \mathrm{~m} / \mathrm{s}$. After 2.5 seconds,
a. what is the velocity of the cell phone? ( $\approx-25.8 \mathrm{~m} / \mathrm{s}$ )
b. how far below the climber will the cell phone be? $(\approx 30.6 \mathrm{~m})$

Hr.

## DERIVING AN EQUATION FOR 1 STICKER:

Derive (which means show how to get) the equation: $\mathbf{v}_{\mathrm{f}}^{2}=\mathbf{v}_{\mathrm{i}}^{2}+\mathbf{2 a} \Delta \mathbf{y}$.
YOU MUST SHOW ALL OF THE ALGEBRAIC STEPS!

Where does this equation come from? All it is is an algebraic combination of two of our other equations. (In other words, solve for $\Delta t$ out of $a=\left(v_{f}-v_{i}\right) / \Delta t$ and plug that expression in for $\Delta t$ into this equation $\Delta y=v_{i} \Delta t+1 / 2 a \Delta t^{2}$ and simplify. Don't forget to FOIL!) Show all the steps very clearly!

