Emily takes a trip, driving with a constant velocity of 89.5 km/h to the north except for a 22 min rest stop. If Emily's average velocity is 74.8 km/h to the north, how long does the trip take, in hours? Give the answer to 2 decimal places; your answer should be between 2.10 and 2.30 hours.

Split the problem into two sections

① Constant Velocity of 89.5 km/h

② Rest stop for 22 min

$\Delta t_{tot} = \Delta t_1 + \Delta t_2$

$= \Delta t_1 + 22 \text{ min}$

Find Δt_1

Given

$V_1 = 89.5$ km/h

$\Delta x_1 = ?$

$\Delta t_1 = ?$

$V_2 = 0$ km/h

$\Delta x_2 = 0$ km

$\Delta t_2 = 22 \text{ min} = .367$ hrs

$V_{avg} = 74.8$ km/h

$$V_{avg} = \frac{\Delta x_{tot}}{\Delta t_{tot}} = \frac{\Delta x_1 + \Delta x_2}{\Delta t_1 + \Delta t_2}$$

$$V_{avg} = \frac{\Delta x_1}{\Delta t_1 + \Delta t_2}$$

$$V = \frac{\Delta x}{\Delta t}$$

$$\Delta x = V \Delta t$$

Find Δt_1

isolate Δt_1

$$V_{avg} = \frac{V_1 \Delta t_1}{\Delta t_1 + \Delta t_2}$$

all variables known except Δt_1

$$V_{avg}(\Delta t_1 + \Delta t_2) = V_1 \Delta t_1$$

Distribute

$$(V_{avg})(\Delta t_1) + (V_{avg})(\Delta t_2) = V_1 \Delta t_1$$

Factor

$$V_{avg} \Delta t_1 - V_1 \Delta t_1 = -V_{avg} \Delta t_2$$

$$\Delta t_1 (V_{avg} - V_1) = -V_{avg} \Delta t_2$$

$$\Delta t_1 = \frac{-V_{avg} \Delta t_2}{(V_{avg} - V_1)} = \frac{-(74.8)(.367)}{(74.8 - 89.5)} = 1.867 \text{ h}$$

Find Δt_{tot}

$$\Delta t_{tot} = \Delta t_1 + \Delta t_2 = 2.234 \text{ h}$$