Answer on Question #44448 – Physics – Other

Question.

Two cars A and B have a velocity of 60mph in the same direction. A is 250ft behind B when the brake is applied to car B causing it to decelerate at the constant rate of 10ft/s^2. In what time A overtake B and how far will each other have traveled?

Given:

$$v_0 = 60\ mph = 88\ \frac{ft}{s}$$

$$l_0 = 250\ ft$$

$$a = -10\ \frac{ft}{s^2}$$

Find:

$$t = ?$$

$$l_A = ?\ l_B = ?$$

Solution.

$$l_A = l_0 + l_B$$

$$l_A = v_0 t$$

$$l_B = v_0 t + \frac{at^2}{2}$$

Therefore,

$$v_0 t = l_0 + v_0 t + \frac{at^2}{2}$$

$$l_0 = -\frac{at^2}{2} \rightarrow t = \sqrt{\frac{-2l_0}{a}}$$

Calculate:

$$t = \sqrt{\frac{-2 \cdot 250}{-10}} = \sqrt{2 \cdot 25} = 5\sqrt{2}\ s = 7.07\ s$$

Let define l_A and l_B:

$$l_A = v_0 t = 88 \cdot 7.07 = 622\ ft$$

$$l_B = v_0 t + \frac{at^2}{2} = 622 - \frac{10 \cdot 50}{2} = 622 - 250 = 372 \; ft$$

Answer.

$$t = \sqrt{\frac{-2l_0}{a}} = 7.07 \; s$$

$$l_A = v_0 t = 622 \; ft$$

$$l_B = v_0 t + \frac{at^2}{2} = 372 \; ft$$