Physics 101Rec
Quiz#1-Sect#05
Chapter 2

Name: Key Id: Sect: 05

Two cars A and B are at rest and are 600 m apart. They start moving at the same time in the same direction and along a straight line. Car A at the back moves with an acceleration of 4.0 m/s^2 and car B in the front moves with an acceleration of 1.0 m/s^2.

a. How long will it take the faster car to overtake the slower car?

b. What is their position when car A ~~under~~over takes car B?

a) For car A: $x_A - \cancel{x_0}^{\,0} = \cancel{v_0 t}^{\,0} + \frac{1}{2} a_A t^2$ — (1)

For car B: $x_B - \underbrace{x_0}_{600m} = \cancel{v_0 t}^{\,0} + \frac{1}{2} a_B t^2$ — (2)

$\Rightarrow x_A = 2t^2$ and $x_B = 600 + \frac{1}{2} t^2$

When car A overtakes car B the two cars have the same position. $\Rightarrow x_A = x_B$

$$2t^2 = 600 + \frac{1}{2} t^2 \Rightarrow 3t^2 = 1200$$

$\Rightarrow t = \pm 20$ sec take positive solution

$\Rightarrow \boxed{t = 20 \text{ sec}}$

b) $x_A = x_B = \frac{1}{2} \times 4 \times (20)^2 = \boxed{800\ m}$

position of car A = position of car B!