

Physics 10154 - Quiz 2B

Two cars are initially 430 meters away from a bridge. Car A is 430 meters North of the bridge, and it starts moving toward the bridge with a speed of 5.0 m/s, accelerating at 2.7 m/s². Car B is 430 meters South of the bridge, and it is moving toward the bridge with a constant speed of 22 m/s.

- a) Do they meet North or South of the bridge?
b) How far from the bridge do they meet?

$$\Delta x_A = 5.0t + \frac{1}{2}(2.7)t^2$$

$$\Delta x_B = 22t$$

$$|\Delta x_A| + |\Delta x_B| = 860 \text{ m}$$

$$5.0t + 1.35t^2 + 22t = 860$$

$$\Rightarrow 1.35t^2 + 27t - 860 = 0$$

$$t = \frac{-27 \pm \sqrt{27^2 + 4(1.35)(-860)}}{2.7}$$

$$= -10 \pm 27.15 \Rightarrow t = 17.15 \text{ s}$$

$$\Delta x_B = 22t = 377 \text{ m, so B ends up short,}$$

(South) of bridge

b) Dist to bridge = $430 - 377 = \boxed{53 \text{ m}}$

Check:

$$\begin{aligned} \Delta x_A &= 5(17.15) \\ &+ 1.35(17.15)^2 \\ &= 483 \text{ m,} \\ &53 \text{ m past} \\ &\text{bridge } \checkmark \end{aligned}$$