Answer on Question#51955 - Physics - Other

George, a physics student, leaves his dormitory at a speed of $v_G^0 = 1.2\frac{\text{m}}{\text{s}}$, heading for the physics building $l = 95\text{m}$ away. Just as he leaves his dorm, Amy, another physics student, leaves the physics building and heads toward George at a steady $v_A = 1.6\frac{\text{m}}{\text{s}}$. George immediately spots her and begins accelerating at $a_G = 0.075\frac{\text{m}}{\text{s}^2}$. Where and when do the two meet? Plot position-versus-time curves for both students on a single graph.

Solution:

Let the dormitory be situated at $x = 0$ and physics building at $x = 95\text{m}$, then George's position as the function of time t is given by

$$x_G(t) = v_G^0 t + \frac{a_G t^2}{2} = 1.2t + 0.0375t^2$$

The Amy's position as the function of t is given by

$$x_A(t) = l - v_A t = 95 - 1.6t$$

To find the time t when they meet we must solve the following equation (when their positions coincide)

$$x_G(t) = x_A(t)$$

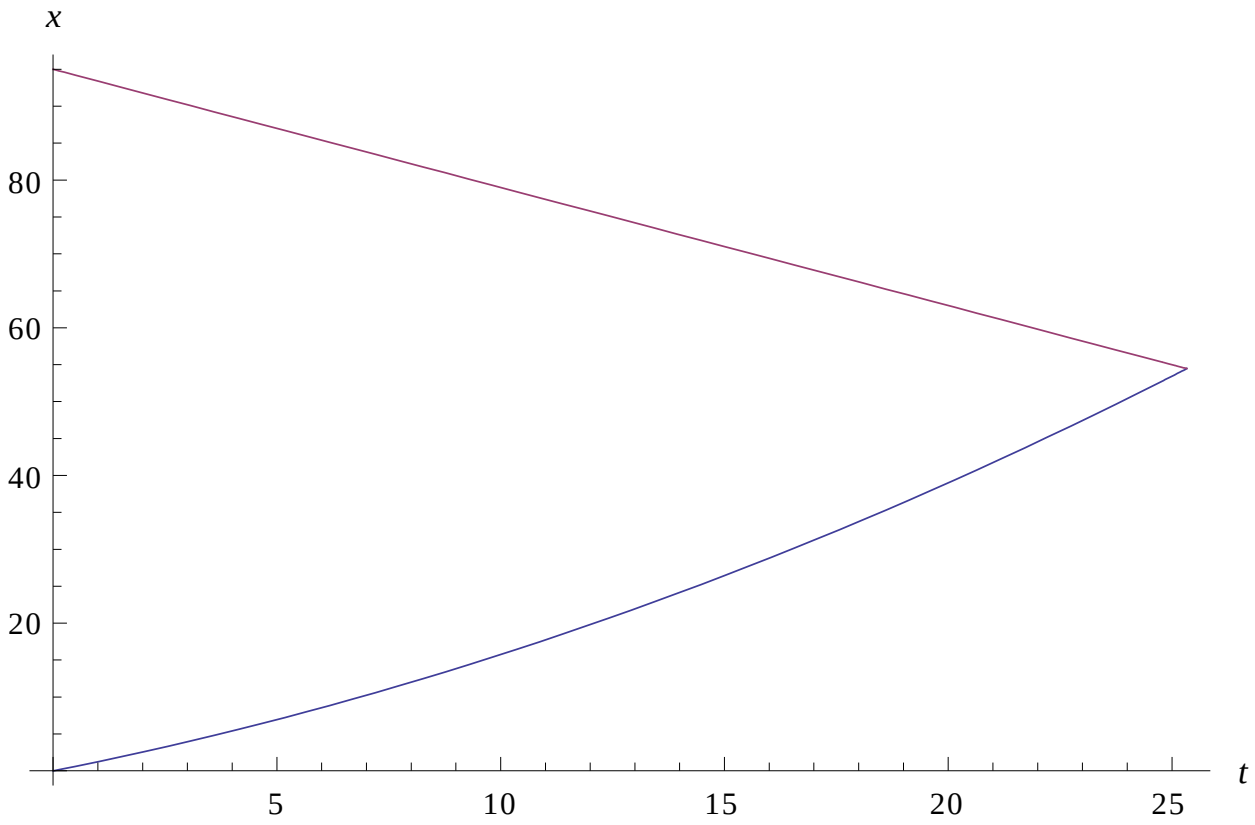
$$1.2t + 0.0375t^2 = 95 - 1.6t$$

This equation has only one positive root

$$t_m = \frac{76}{3}\text{s}$$

The position of both Amy and George is given by

$$x_G(t_m) = x_A(t_m) = 95 - 1.6t_m = 95 - 1.6 \cdot \frac{76}{3} = \frac{817}{15}\text{m}$$



Red line – Amy, blue line – George.

Answer: $\frac{76}{3}$ s, $\frac{817}{15}$ m.