6, 3, 0.5

4.8

documentation?

120. $v_{xf}^2 = v_{xi}^2 + 2a_x(x_f - x_i)$

$0 = (44)^2 + 2a(45)$

$0 = 1936 + 90a$

$a = -21.5$

∴ a constant decelleration of 21.5 ft/sec^2 to brake from 44 ft/sec to 0 ft/sec in 45 ft.

another way:

$a =$ acceleration (constant) — The variable a is chosen to represent the acceleration constant.

$f(t) = a$ — The function with respect to time is equal to a.

$\int a\,dt = at + c = \text{velocity} = v(t)$ — The antiderivative of a is taken to express a function of velocity (v) in respect to time.

$\therefore v(t) = at + c$

$\int v\,dt = \int (at + c)\,dt = \frac{1}{2}at^2 + ct + k = x(t) = \text{position}$

The antiderivative of velocity is taken to express a function of position (x) with respect to time.

$v(0) = a(0) + c = c = 44\ \text{ft/s}$ — the problem shows that at time = 0, the velocity of the car is 44 ft/sec. This solves for the "c" constant as 44 ft/s.

$\therefore v(t) = at + 44\ \text{ft/s}$

$x(0) = \frac{1}{2}a(0)^2 + 44\ \text{ft/s}\,(0) + k = k = 0$ — This is the mathematical representation of position function at time 0. The position at time = 0 is set to 0, marking the beginning of the measurement.

$\therefore x(t) = \frac{1}{2}at^2 + 44\ \text{ft/s}\ t + 0$

$v(t) = 0 = at + 44\ \text{ft/s} \Rightarrow \frac{-44}{a} = t$

$x(t) = 45 = \frac{1}{2}at^2 + 44\ \text{ft/s}\ t + 0$

$45 = \frac{1}{2}a\left(\frac{-44}{a}\right)^2 + 44\left(\frac{-44}{a}\right)$

$45 = \frac{968}{a} - \frac{1936}{a}$

$a = -21.5\ \text{ft/s}^2$

Using the two known equations, we solve for the acceleration by first determining the term for t and substituting it into the position function. The acceleration is determined to be $-21.5\ \text{ft/s}^2$

∴ constant deceleration of 21.5 ft/s^2 to brake from 44 ft/s to 0 ft/sec in 45 ft

Gary