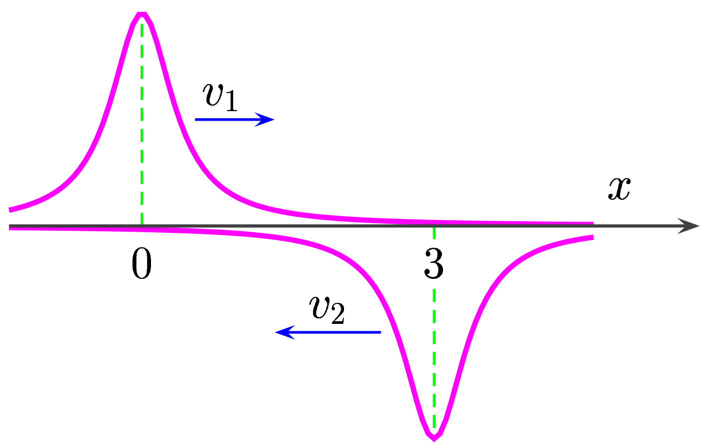
Consider the superposition of two pulses, $y = y_1 + y_2$, where

$$y_1 = \frac{A}{(x - 2t)^2 + 1} \text{ and } y_2 = \frac{-A}{(x + 2t - 3)^2 + 1}$$



The location x_P, where $y = 0$ for all t is

A) $x_P = 0.5$
B) $x_P = 1.0$
C) $x_P = 1.5$
D) $x_P = 2.0$
E) $x_P = 2.5$

$$\begin{aligned} y &= y_1 + y_2 \\ &= \frac{A\,[(x + 2t - 3)^2 + 1 - (x - 2t)^2 - 1]}{[(x - 2t)^2 + 1][(x + 2t - 3)^2 + 1]} \end{aligned}$$

for $y = 0$, we have

$$\begin{aligned} 0 &= (x + 2t)^2 - 6\,(x + 2t) + 9 - (x - 2t)^2, \quad \text{so} \\ &= -6x + 8tx - 12t + 9, \quad \text{so} \\ &= (4t - 3)\,(2x - 3), \quad \text{so at all times } y = 0 \text{ at} \end{aligned}$$

$$x_P = \frac{3}{2}.$$

They have the same speed, so one can also look at the plot and see that $y = 0$ half way between the pulses. Also, at $t = \dfrac{3}{4}$, $y = 0$ at all positions.

Answer **C**.

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