That Darn River Boat Problem

Problem #4 on the Algebra 2 B Unit 3 Lesson 7 quick check (also Honors Algebra 2 B Unit 2 Lesson 7):

The speed of the current in a river is 5 miles per hour. A boat leaves a dock on the bank of the river, travels upstream 25 miles, and returns to the dock in 12 hours. What is the speed of the boat in still water?

Setup this as a distance, rate, time table

direction	Distance	Rate (Speed)	Time
upstream	25 miles	(x – 5) mph	25 / (x-5), T=D/R
downstream	25 miles	(x + 5) mph	25 / (x+5), T=D/R

Insight from table: combined times are 12 hours.

down stream + upstream = 12 hours

Given: $hours = \frac{miles}{\left(\frac{miles}{hour}\right)}$

$$\frac{25miles}{(x+5)} + \frac{25miles}{(x-5)} = 12hours$$

$$\frac{25(x-5)}{(x+5)(x-5)} + \frac{25(x+5)}{(x+5)(x-5)} = 12$$

$$\frac{25x-125+25x+125}{(x^2-25)} = 12$$

$$\frac{50x}{(x^2-25)} = 12$$

$50x = 12(x^2-25)$ then.... $50x = 12x^2 - 300$

$0 = 12x^2 - 50x - 300$

Using the **quadratic formula** to solve, answers are 7.5 & -3 1/3

Summary

The only answer that can be is 7.5 mph, because -3 1/3 makes no sense.
Upstream it takes 10 hours, and return trip is 2 hours.