1 | boatman problem

Target displacement: $\langle 3\text{km}, 2\text{km}\rangle$

We are working with the velocities of the boat and the river. The velocity of the river is defined as $r = \langle 0, -3.5\rangle$. We want to find vector $v = \langle v_x, v_y\rangle$ s.t.

$$|v| = 13 \text{ km/h}$$
$$\lambda(v + r) = \langle 3, 2\rangle$$

Where the trip will take λ hours

$$v_x^2 + v_y^2 = 13^2$$
$$\lambda(v_x + 0) = 3$$
$$\lambda(v_y + -3.5) = 2$$

$$v_x = \frac{3}{\lambda}$$
$$v_y = \frac{2}{\lambda} + 3.5$$
$$\frac{3^2}{\lambda^2} + \left(\frac{2}{\lambda} + 3.5\right)^2 = 13^2$$
$$\frac{3^2}{\lambda^2} + \frac{2^2}{\lambda^2} + 3.5^2 + \frac{4(3.5)}{\lambda} = 13^2$$
$$\frac{3^2 + 2^2}{\lambda^2} + \frac{4(3.5)}{\lambda} = 13^2 - 3.5^2$$