A 6.2 kg object heading north at 3.00 m/s collides with an 8.00 kg object heading west at 3.5 m/s. If these two masses stick together upon collision, what is their velocity after collision? **(2.4 m/s 56° W of N)**

$P_0 = P$ $\begin{cases} P_{0x} = P_x \\ P_{0y} = P_y \end{cases}$

$V_{1x} = V_{2x} = V_{1,2x}$ same

$P_{0x} = P_x$

$m_1 V_{10x} + m_2 V_{20x} = m_1 V_{1x} + m_2 V_{2x}$

$6.2 \times 0 + 8 \times (-3.5) = V_{1,2x}(6.2 + 8)$ (zero)

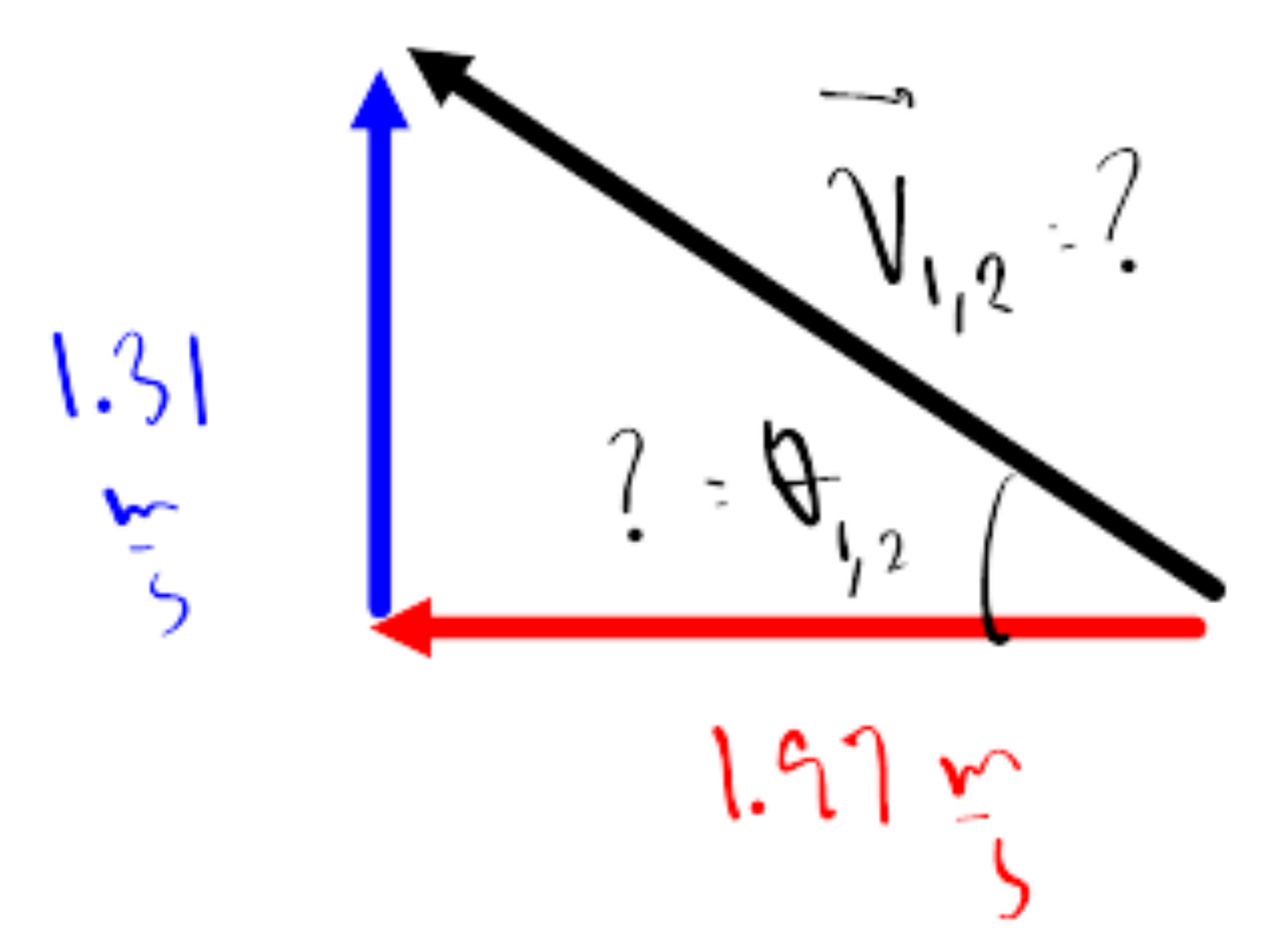
$\frac{-28}{14.2} = V_{1,2x} = -1.97 \frac{m}{s}$ (West)

$P_{0y} = P_y$ (common factor)

$m_1 V_{10y} + m_2 V_{20y} = m_1 V_{1y} + m_2 V_{2y}$

$6.2 \times 3 + 8 \times 0 = V_{1,2y}(6.2 + 8)$

$\frac{18.6}{14.2} = V_{1,2y} = 1.31 \frac{m}{s}$ (North)



$V_{1,2}^2 = V_{1,2x}^2 + V_{1,2y}^2$

$V_{1,2} = \sqrt{1.97^2 + 1.31^2}$

$V_{1,2} = 2.37 \frac{m}{s} \approx 2.4 \frac{m}{s}$ Magnitude!

$\theta_{1,2} = \tan^{-1} \frac{V_y}{V_x}$

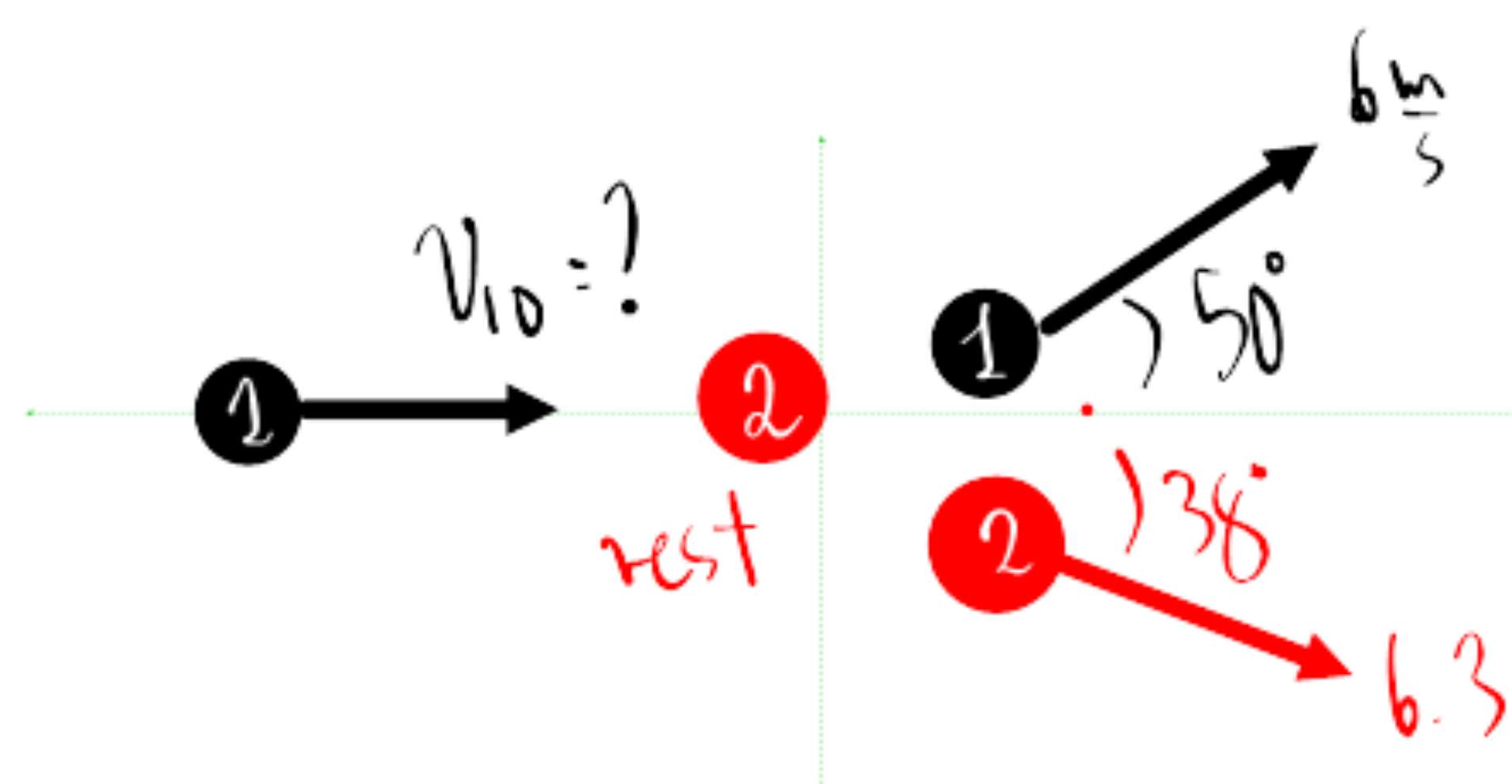
$\theta_{1,2} = \tan^{-1}\left(\frac{1.31}{-1.97}\right) = -33.6° \approx -34°$ N of W (56 W of N)

A 50.0 kg object moving east at an unknown velocity when it collides with a 60.0 kg stationary object. After collision, the 50.0 kg object is travelling at a velocity of 6.00 m/s at 50.0° N of E and the 60.0 kg object is traveling at a velocity of 6.3 m/s at 38.0° S of E.

a. What is the velocity of the 50.0 kg object before collision?

b. Determine wheter this collision was elastic or inelastic.

$m_1 = 50$ kg
$m_2 = 60$ kg



$P_{0x} = P_x$

$m_1 V_{10x} + m_2 V_{20x} = m_1 V_{1x} + m_2 V_{2x}$ (rest = 0)

$50 \cdot V_{10x} = 50 \cdot 6 \cos(50) + 60 \times 6.3 \cos(38)$

$V_{10x} = \frac{490.7}{50} = 9.81 \frac{m}{s}$

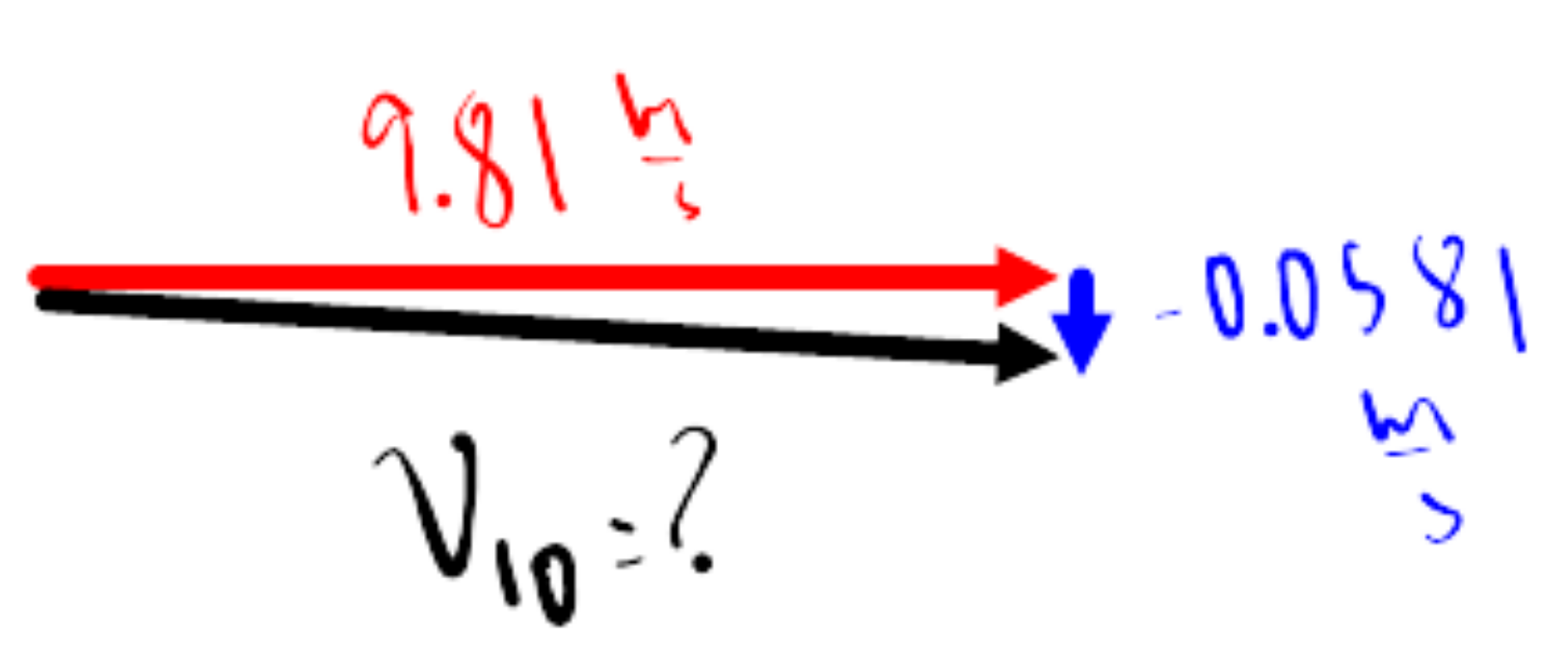
$P_{0y} = P_y$

$m_1 V_{10y} + m_2 V_{20y} = m_1 V_{1y} + m_2 V_{2y}$ (zero)

$50 \cdot V_{10y} = 50 \cdot 6 \sin(50) + 60 \times (-6.3) \sin(38)$

$V_{10y} = \frac{-2.91}{50} = -0.0581 \frac{m}{s}$

Yes ≈ East because $V_{10y} \approx 0$



$V_{10}^2 = V_{10x}^2 + V_{10y}^2$

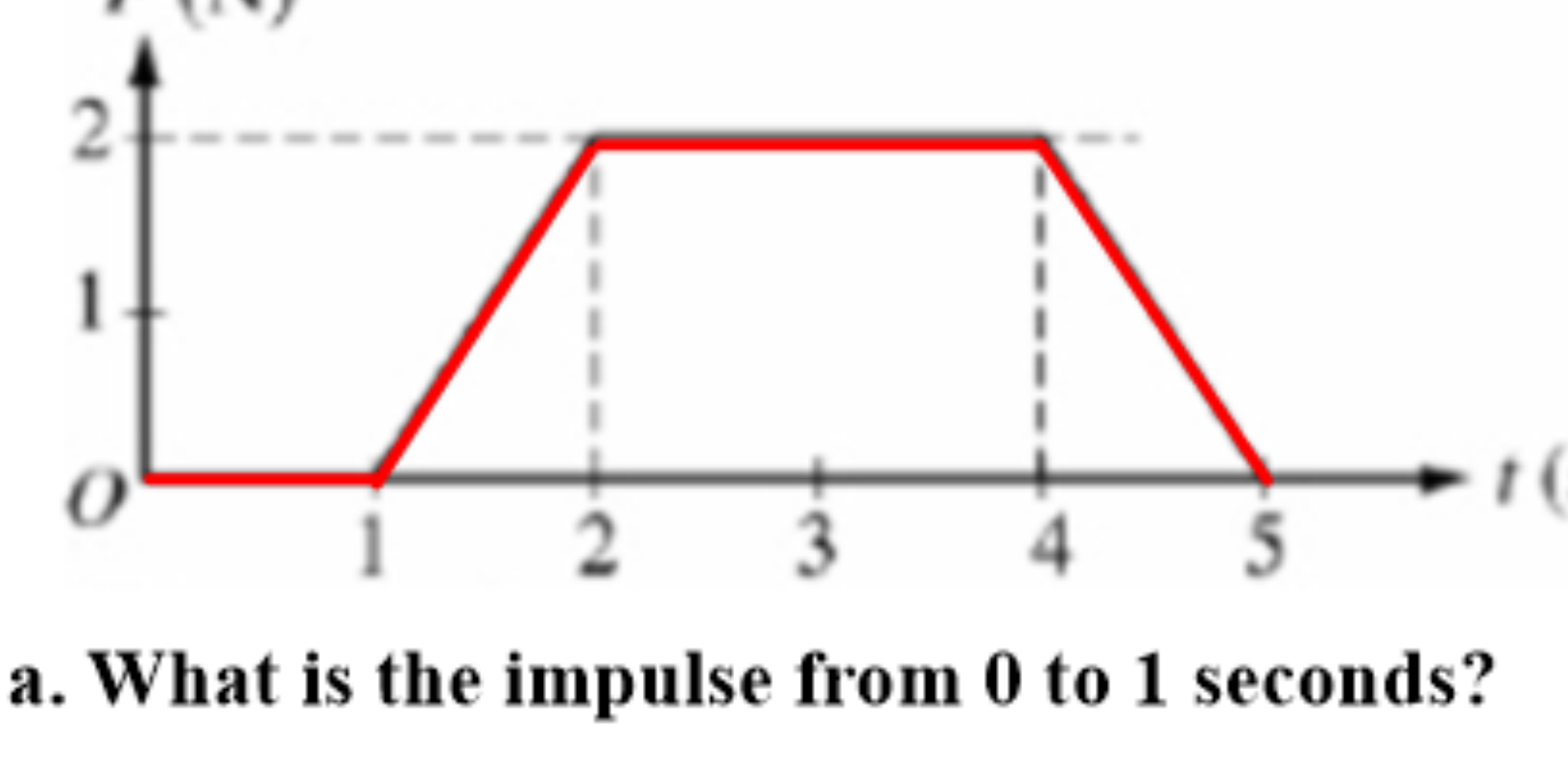
$V_{10} = \sqrt{9.81^2 + 0.0581^2} \approx 9.8 \frac{m}{s}$

$\theta = \tan^{-1}\left(\frac{-0.0581}{9.81}\right)$

$\theta = -0.351 \approx 0°$ Horizontal

For your practice is CONVENIENT that you answer the following example. We will answer together next class.

A 2.0 kg objects initially at rest and it is subjected to a force of magnitude F in the directioin of motion. A graph of F as a function of time is shown above.



$\vec{p} = m\vec{v}$

$\Delta\vec{p} = \vec{F}\Delta t$

a. What is the impulse from 0 to 1 seconds?

b.What is the impulse from 1 to 2 seconds?

c. What is the impulse from 0 to 5 seconds?

d. Using the information from the text above combine with the graph, calculate the final velocity at the 2 second mark.

e. Calculate the velocity at the 5 second mark.