

Solutions

PHY-205A-002 (Midterm Exam 01) Fall 2025

①

Problem 1

$$[x] = \sqrt{[A]^2} = \sqrt{[B]^2 [x]^2}$$

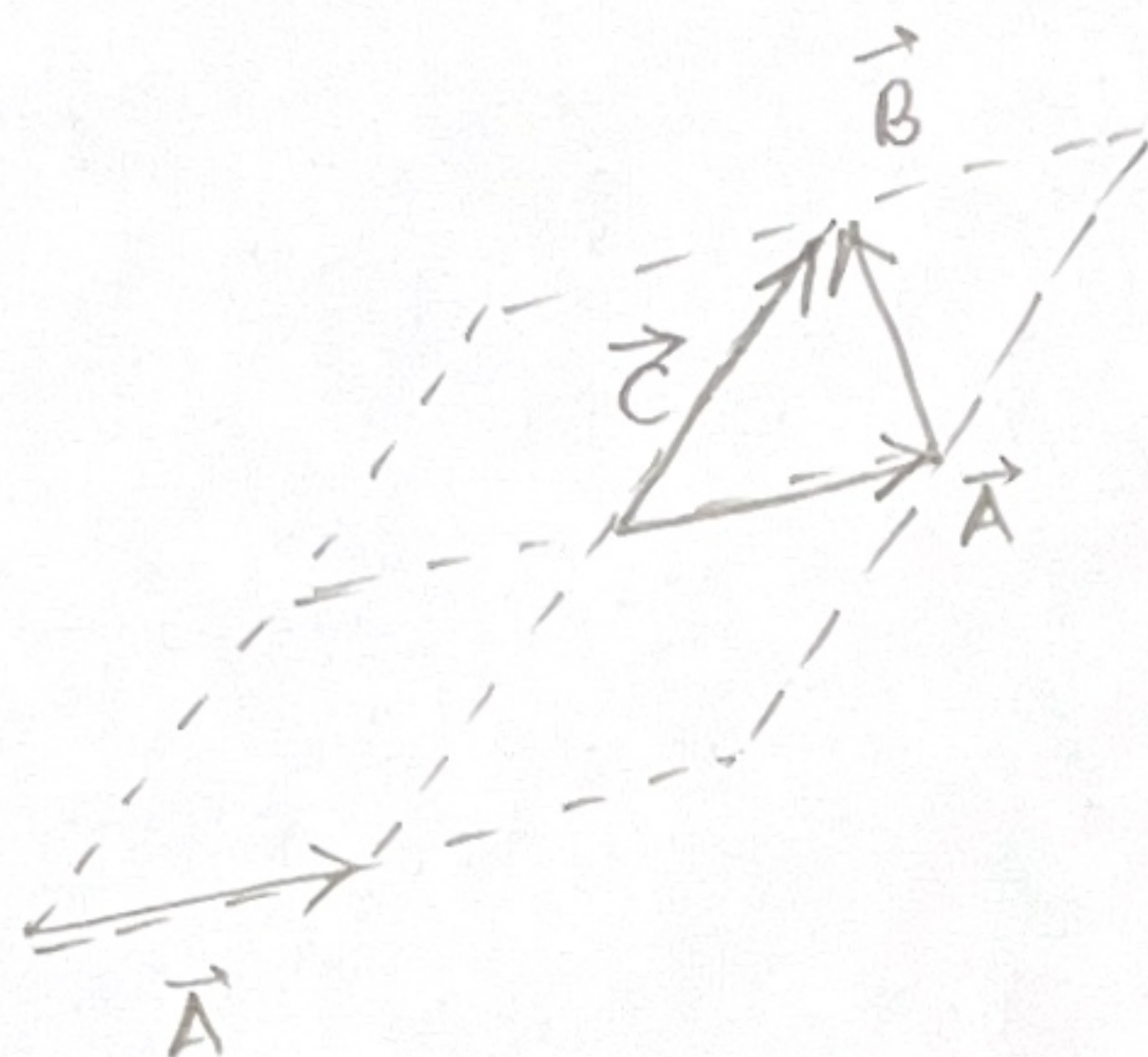
$$\Rightarrow [B] = 1$$

B is dimensionless.

Problem 2

Velocity at $t = 3h = \text{slope at } 3h = 0.$

Problem 3



$$\vec{C} = \vec{A} + \vec{B}$$

Problem 4

$$\begin{aligned} \vec{V}_B &= V_0 \cos \theta_0 \hat{i} + 0 \hat{j} \\ &= 28 \cos 60. \hat{i} + 0 \hat{j} = 14 \hat{i} \frac{m}{s} \end{aligned}$$

magnitude = $14 \frac{m}{s}$
direction: along $\hat{i}$

Problem 5

$$\Delta y = -50.0m$$

$$\Delta t =$$

$$v_i = -15 \frac{m}{s}$$

$$v_f =$$

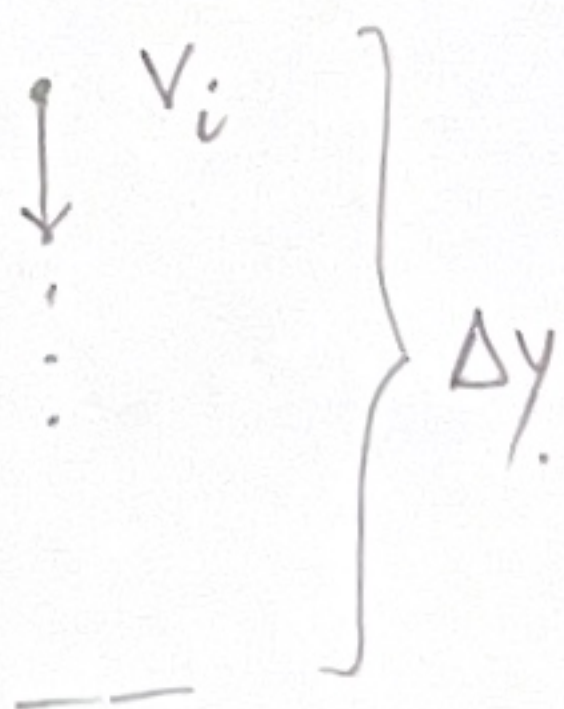
$$a = -9.8 \frac{m}{s^2}$$

$$\begin{aligned} \Delta y &= v_i \Delta t + \frac{1}{2} a \Delta t^2 \\ -50.0 &= -15 \Delta t + \frac{1}{2} (-9.8) \Delta t^2 \end{aligned}$$

$$4.9 \Delta t^2 + 15 \Delta t - 50.0 = 0$$

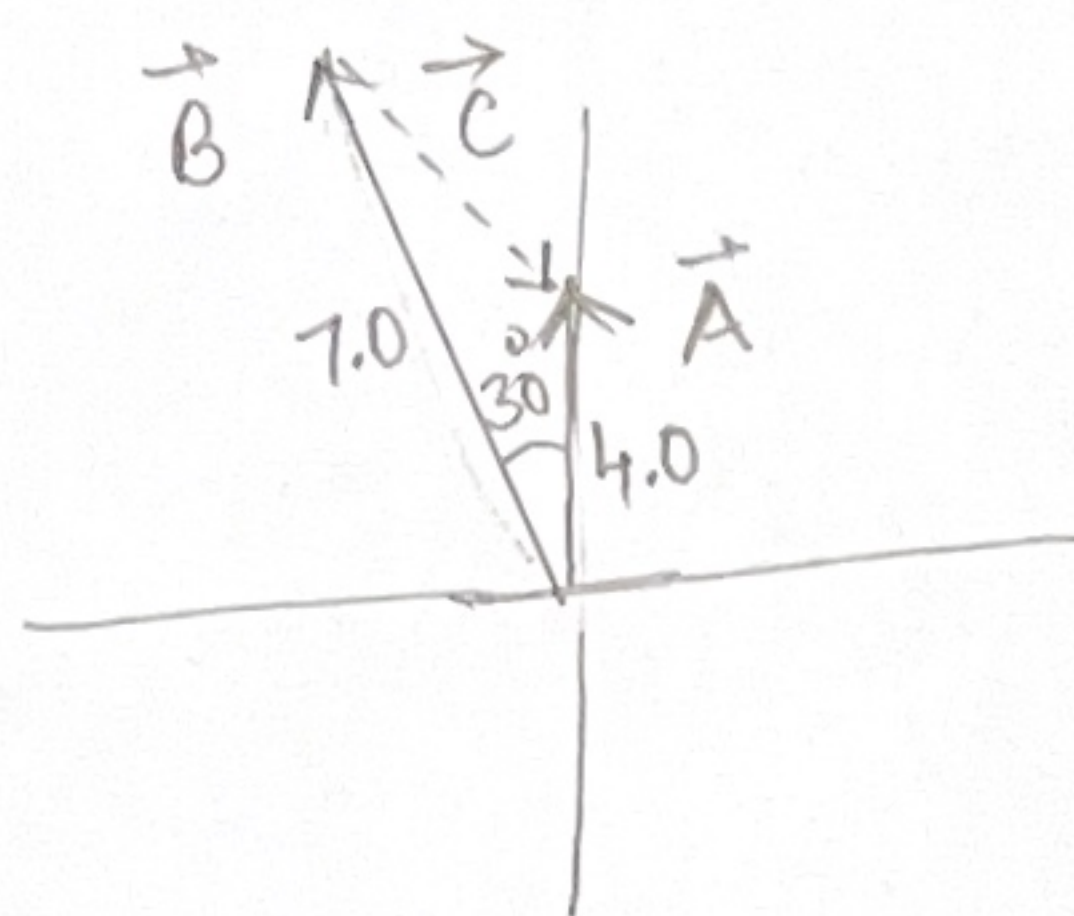
$$\Delta t = \frac{-15 \pm \sqrt{15^2 - 4(4.9)(-50.0)}}{2(4.9)}$$

$$= \frac{-15 \pm 35}{9.8} = +2.0s \text{ (OR) } -5.1s$$



Answer: 2.0 s.

Problem 6



$$\vec{A} = \vec{B} + \vec{C}$$

$$\vec{C} = \vec{A} - \vec{B}$$

$$\vec{A} = 0\hat{i} + 4.0\hat{j}$$

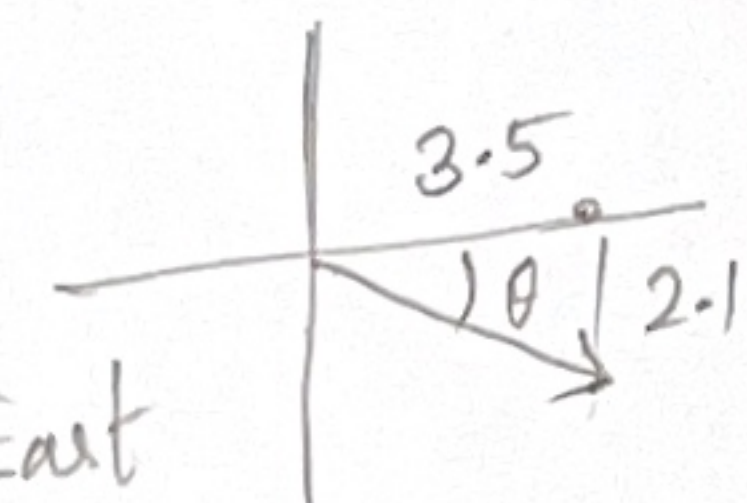
$$\vec{B} = -7.0\sin 30^\circ\hat{i} + 7.0\cos 30^\circ\hat{j}$$

$$= -3.5\hat{i} + 6.1\hat{j}$$

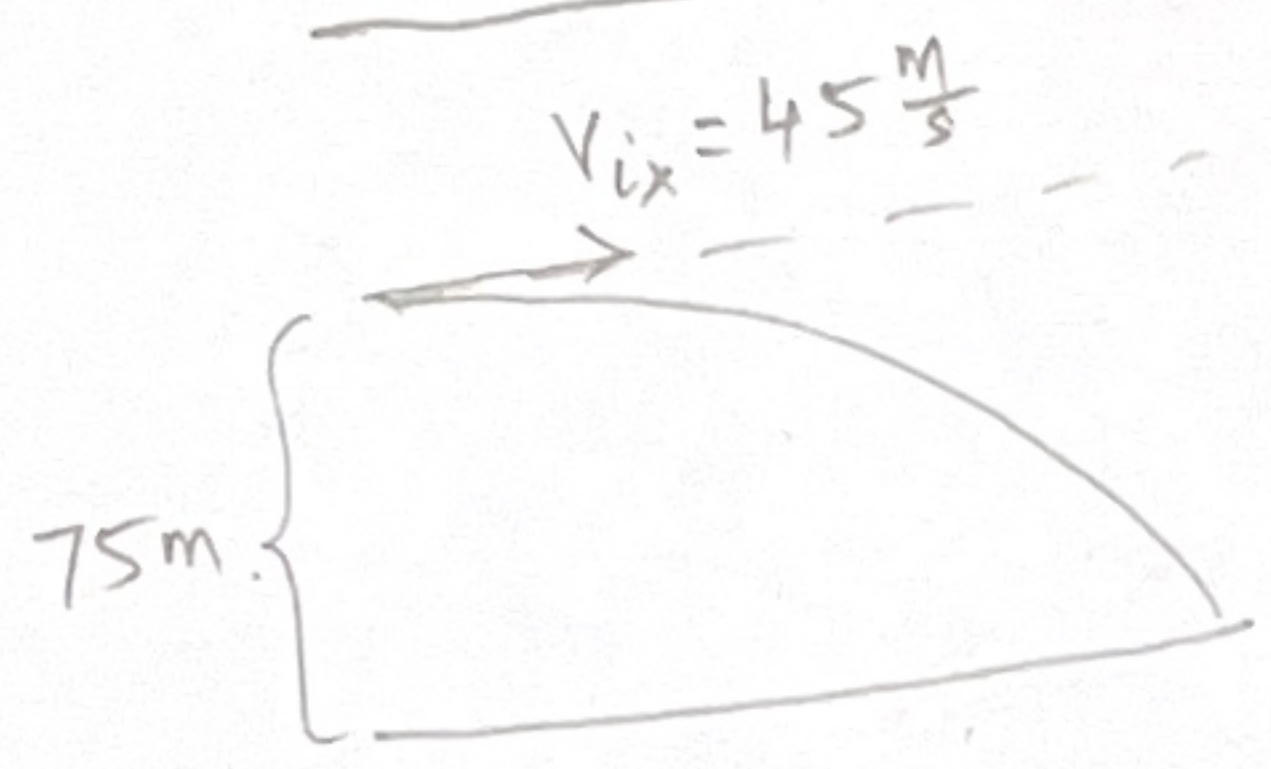
$$\vec{A} - \vec{B} = \vec{C} = +3.5\hat{i} - 2.1\hat{j}$$

(a) $|\vec{C}| = \sqrt{3.5^2 + 2.1^2} = 4.1 \text{ km}$

(b) $\theta = \tan^{-1} \frac{2.1}{3.5} = 31^\circ \text{ South of East}$



Problem 7



$$\Delta x =$$

$$\Delta t =$$

$$v_{ix} = +45 \frac{\text{m}}{\text{s}}$$

$$\Delta y = -75 \text{ m}$$

$$\Delta t =$$

$$v_{iy} = 0$$

$$v_{fy} =$$

$$a = -9.8 \frac{\text{m}}{\text{s}^2}$$

$$v_{fy} = \sqrt{v_{iy}^2 + 2a\Delta y}$$

$$= \sqrt{0^2 + 2(-9.8)(-75)}$$

$$= 38 \frac{\text{m}}{\text{s}}$$

$$v_{fx} = v_{ix} = 45 \frac{\text{m}}{\text{s}}$$

$$v_f = \sqrt{v_{fx}^2 + v_{fy}^2}$$

$$= \sqrt{45^2 + 38^2}$$

$$= 59 \frac{\text{m}}{\text{s}}$$