Solutions PHYS-205A-001 (Fall 2017) Midterm Exam 1

Prob. 1

Since lengths a, b, and c, are subtracted from s to construct s-a, s-b, and s-c, we conclude that s must also be a length. Thus,

$$[s] = L.$$

Prob. 2

$$x = 5.0 - 7.0\,t^2$$

$$v = \frac{dx}{dt} = -14\,t$$

when it stops, we have $v = 0 \Rightarrow t = 0$.

Thus, it stops at $t = 0$.

$$x(0) = 5.0 - 7.0\,(0)^2$$
$$= 5.0\ m$$

Prob. 3

$\Delta x = 44.0\ m$ $\qquad v_i = ?$

$\Delta t = 8.20\ s$ $\qquad v_f = 2.50\ \frac{m}{s}$

$a =$

$$\frac{\Delta x}{\Delta t} = \frac{v_i + v_f}{2}$$

$$\frac{44.0}{8.20} = \frac{v_i + 2.50}{2}$$

$$v_i = 8.23\ \frac{m}{s}$$

Prob. 4

$\Delta y =$

$\Delta t = 3.00\,s$

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

$V_i = ?$

$V_f = 0$

$V_f = V_i + a\,\Delta t$

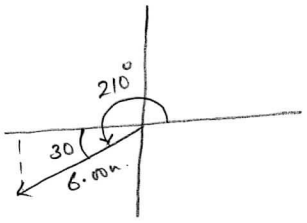
$0 = V_i + (-9.8)(3.00)$

$V_i = 29.4 \frac{m}{s}$

Prob. 5

$x = -6.00 \cos 30 = -5.20\ m$

$y = -6.00 \sin 30 = -3.00\ m$

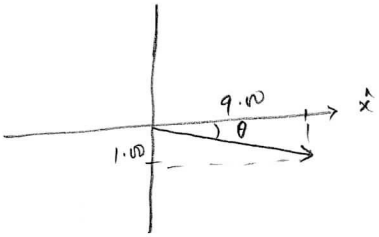


Prob. 6

$\vec{A} = 4.00\,\hat{i} + 2.00\,\hat{j}$

$\vec{B} = -5.00\,\hat{i} + 3.00\,\hat{j}$

$\vec{C} = \vec{A} - \vec{B} = 9.00\,\hat{i} - 1.00\,\hat{j}$



magnitude: $|\vec{C}| = \sqrt{9.00^2 + 1.00^2}$

$= 9.06$

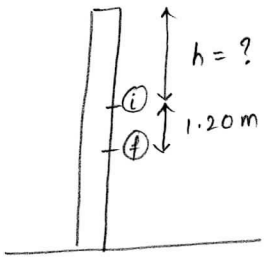
direction: $\theta = \tan^{-1}\left(\frac{1.00}{9.00}\right) = 6.34°$ clockwise w.r.t $\hat{x}$.

Prob. 7

$\Delta y = -1.20\ m$ $\quad V_i = ?$

$\Delta t = 0.125\ s$ $\quad V_f =$

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



$$\Delta y = V_i \Delta t + \frac{1}{2} a \Delta t^2$$

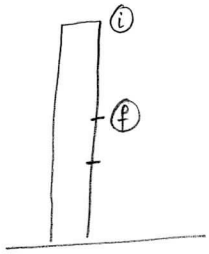
$$-1.20 = V_i (0.125) + \frac{1}{2}(-9.8)(0.125)^2$$

$$V_i = -8.99\ \frac{m}{s}$$

$\Delta y = h = ?$ $\quad V_i = 0$

$\Delta t =$ $\quad V_f = -8.99\ \frac{m}{s}$

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



$$\Delta y = \frac{V_f^2 - V_i^2}{2a}$$

$$= \frac{(-8.99)^2 - 0^2}{2(-9.8)} = -4.12\ m$$

Thus, the roof is 4.12 m above the window top.