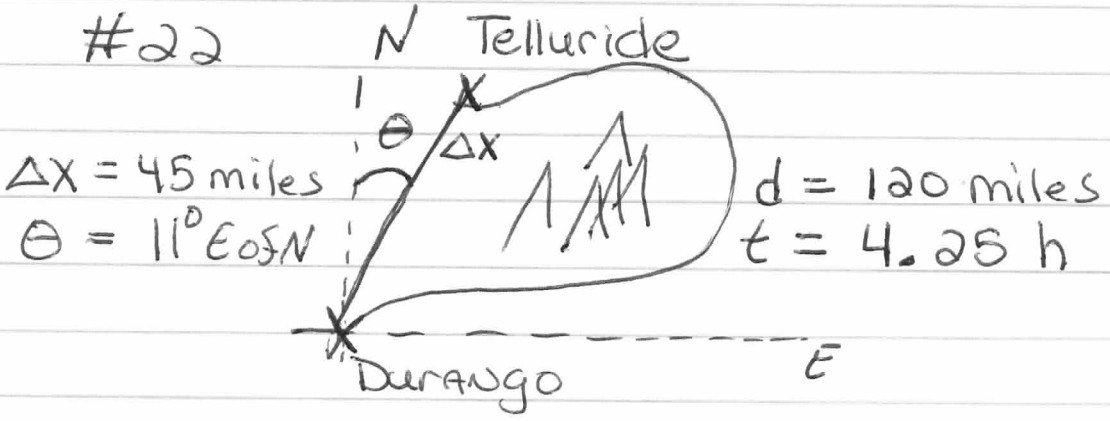
Hw #2

Pg. 103 Under Problems 4.1

#22



a) Average driving speed

$$\text{Ave. Speed} = \frac{\text{distance traveled}}{\text{time}}$$

$$= \frac{120 \text{ miles}}{4.25 \text{ hours}} = \underline{28.2 \text{ miles/hour}}$$

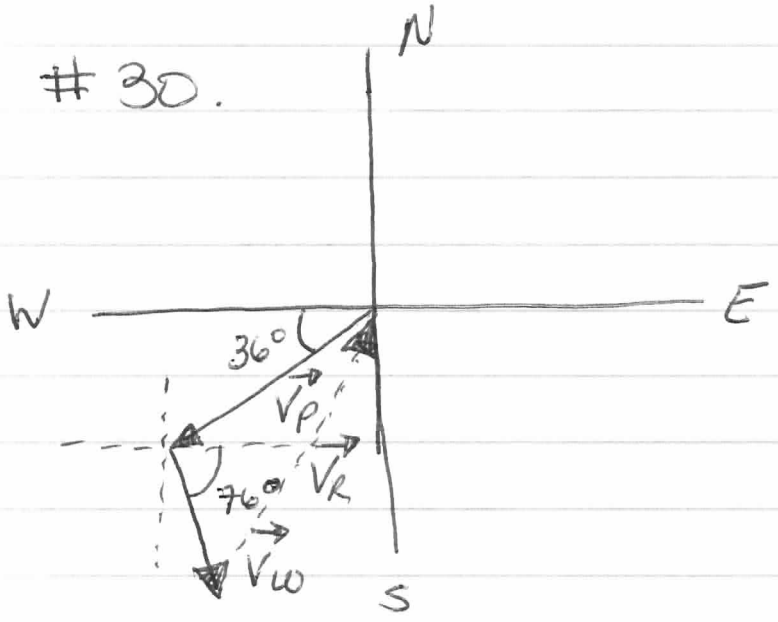
b) Average travel velocity

$$\text{Ave Velocity} = \frac{\Delta X}{t} = \frac{45 \text{ miles}}{4.25 \text{ hours}}$$

$$= 10.58 \text{ miles/hour}$$
$$11° \text{ E of N}$$

Pg. 103 Problems 4.1

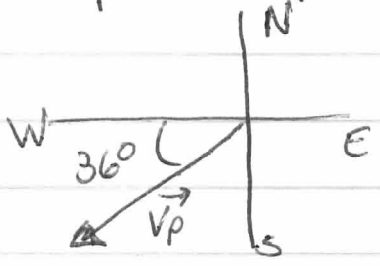
#30.



- Need New velocity: $\vec{V}_R = \vec{V}_p + \vec{V}_w$
- Find components of $\vec{V}_p$, $\vec{V}_w$

	X	Y
V_p	-121.35	-88.16
V_w		
V_R		

$\vec{V}_p$ components: $\vec{V}_p = 150$ mi/h @36° S of W



V_{px}: $V_{px} = \vec{V}_p \cos 36°$

$= (150 \text{ mi/h})(.8090)$

$= -121.35$ mi/h

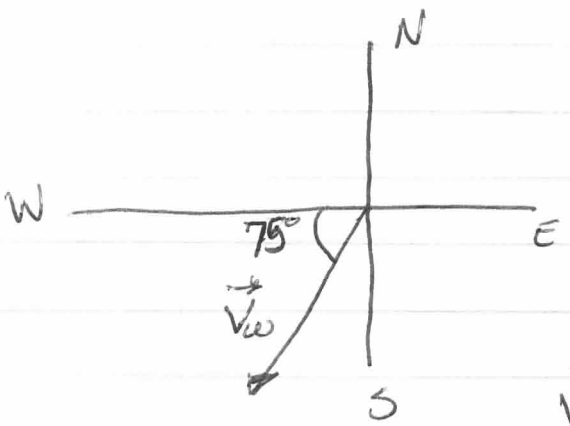
V_{py}: $V_{py} = \vec{V}_p \sin 36°$

$= (150 \text{ mi/h})(.5878)$

$= -88.16$ mi/h

#30 cont.

$\vec{V}_w$ component: $\vec{V}_w = 55.0$ mi/h @ 75° S of W*



* b/c the vector points toward S of W b/c the wind is out of N of E *

$\vec{V}_{wx}$: $\vec{V}_{wx} = \vec{V}_w \cos\theta$
$= 55.0$ mi/h cos 75°
$= 55.0$ mi/h (.2588)
$= -14.23$ mi/h

	x	y
$\vec{V}_p$	-121.35	-88.16
$\vec{V}_w$	-14.23	-53.12
$\vec{V}_R$	-135.58	-141.28

$\vec{V}_{wy}$: $\vec{V}_{wy} = \vec{V}_w \sin\theta$
$= 55.0$ mi/h sin 75°
$= 55.0$ mi/h (.9659)
$= -53.12$ mi/h

$\vec{V}_{Rx} = \vec{V}_{px} + \vec{V}_{wx} = -121.35 + -14.23 = -135.58$ mi/h
$\vec{V}_{Ry} = \vec{V}_{py} + \vec{V}_{wy} = -88.16 + -53.12 = -141.28$ mi/h

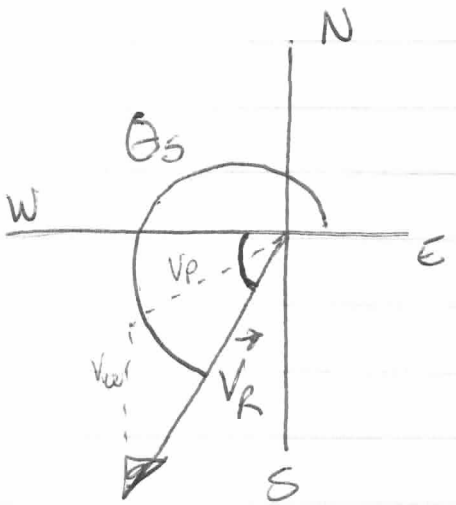
$$\vec{V}_R = \sqrt{V_{Rx}^2 + V_{Ry}^2} = \sqrt{(-135.58)^2 + (-141.28)^2}$$
$$= \sqrt{18381.9 + 19960.0}$$
$$= \sqrt{38341.9} = 195.8 \text{ mi/h}$$

#30 cont

$$\theta = \tan^{-1}\frac{V_{RY}}{V_{RX}} = \tan^{-1}\frac{141.28}{135.58}$$

$$= \tan^{-1}(1.042)$$

$$\theta = 46.2^\circ \text{ S of W}$$



$\vec{V}_R = 195.8$ mi/h @ 46.2° S of W

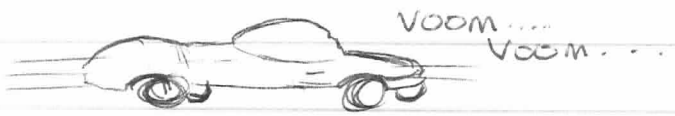
in Standard position

$\theta_S = 180^\circ + 46.2^\circ = 226.2^\circ$

$\vec{V}_R = 195.8$ mi/h @ 226.2°

Pg. 115 Problem 4.3

#10



$V_I = 0$ m/s → $V_F = 50.0$ m/s

$t = 9.80$ s

- Looking for distance traveled

USE $\Delta x = \frac{1}{2}(V_f + V_I)t$

$= \frac{1}{2}(50.0 \text{ m/s} + 0 \text{ m/s})9.80 \text{ s}$

$= (25.0 \text{ m/s})(9.80 \text{ s})$

$= \underline{245.0 \text{ m}}$

OR Find acceleration

$$\vec{a} = \frac{\vec{V_f} - \vec{V_i}}{t} = \frac{50.0 \text{ m/s} - 0 \text{ m/s}}{9.80 \text{ s}} = 5.10 \text{ m/s}^2$$

then $\Delta x = V_{ix} t + \frac{1}{2} a t^2$

$\Delta x = (0 \text{ m/s})(9.80 \text{ s}) + \frac{1}{2}(5.10 \text{ m/s}^2)(9.80 \text{ s})^2$

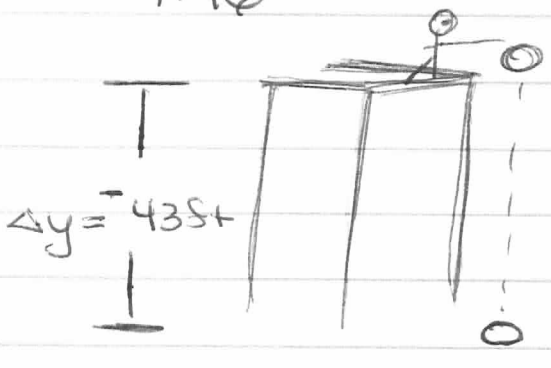
$= 0 \text{ m} + (2.55 \text{ m/s}^2)(96.04 \text{ s}^2)$

$= \underline{245.0 \text{ m}}$

Either way works but 1st method is best.

Pg. 115 Problems 4.3

#16



Find the magnitude of $\vec{V}_f$

$$\vec{V}_f^{\,2} = \vec{V}_I^{\,2} - 2g\Delta y$$

$$\vec{V}_f^{\,2} = (-62.0)^2 - 2(32.2\ \text{ft/s}^2)(-435\text{ft})$$

$$= 3844\ \text{ft}^2/\text{s}^2 - (64.4\ \text{ft/s}^2)(-435\text{ft})$$

$$= 3844\ \text{ft}^2/\text{s}^2 - (-2769.2\ \text{ft}^2/\text{s}^2)$$

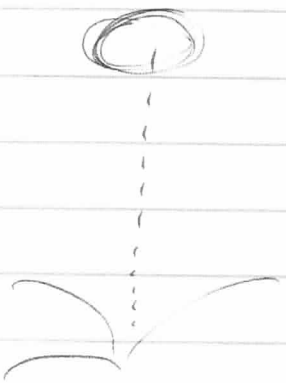
$$\vec{V}_f^{\,2} = 6613.2\ \text{ft}^2/\text{s}^2$$

$$\vec{V}_f = \sqrt{6613.2\ \text{ft}^2/\text{s}^2} = -81.32\ \text{ft/s}$$

$$\underline{V_f = 81.32\ \text{ft/s}}$$

Pg. 115 Problems 4.3

#22



$\vec{V}_I = -30.0\ ft/s$

$g = 32.2\ ft/s$

$t = 3.50\ s$

$V_f = ?$

a) Find the speed of the rock on impact

$$\vec{V}_f = \vec{V}_i - gt$$
$$= -30.0\ ft/s - (32.2\ ft/s)(3.50s)$$
$$= -30.0\ ft/s - 112.7\ ft/s$$

$$\vec{V}_f = -142.7\ ft/s \qquad \underline{V_f = 142.7\ ft/s}$$

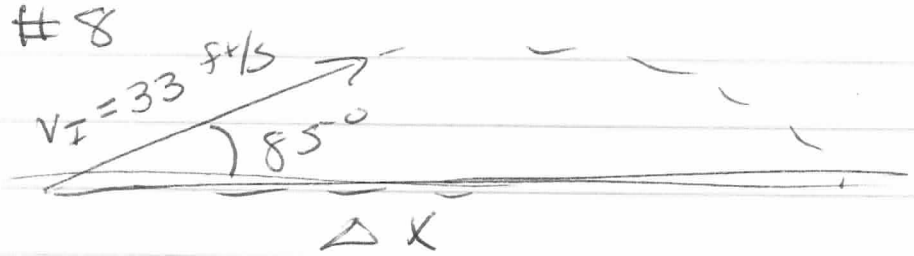
b) $\Delta y = V_I t - \frac{1}{2} g t^2$

$$= (-30.0\ ft/s)(3.50s) - \frac{1}{2}(32.2\ ft/s^2)(3.50s)^2$$
$$= -105\ ft - (16.1\ ft/s^2)(12.25\ s^2)$$
$$= -105\ ft - 197.225\ ft$$
$$= -302.22\ ft$$

height = 302.22 ft

Pg. 121 Problems 4.4

#8



We WANT the range, Δx
Δx is the horizontal so . . .

$$\Delta x = v_x t$$

- Need v_x, t

$$v_x = v_I \cos\theta = (33 \text{ ft/s}) \cos 85^\circ$$
$$= (33 \text{ ft/s})(.087155)$$
$$= \underline{2.876 \text{ ft/s}}$$

to get time use the y-directions:

- remember $v_{Top} = 0$ ~~ft~~/s
- Total time = 2(up)

$$v_f = v_I - gt \qquad t = \frac{v_f - v_I}{-g}$$

$$t = \frac{0 \text{ ~~ft~~/s} - v_{Iy}}{-g}$$

#8 cont.

Need V_{Iy}

$$V_{Iy} = V \sin\theta = (33\ ft/s)\sin(85°)$$
$$= (33\ ft/s)(.9961)$$
$$= +32.87\ ft/s$$

$$t = \frac{0 - (32.87\ ft/s)}{-32.2\ ft/s^2} = 1.02\ s$$

total time for whole path
$$2(1.02\ s) = 2.042\ s$$

USE time in $\Delta x = V_x t$

$$\Delta x = (2.876\ ft/s)(2.042\ s)$$

$$\Delta x = 5.87\ ft$$

* BTW:
I am hoping you read the chapter and found out $g = 32.2\ ft/s^2$ .... if NOT go look at it on page 111.
I did take this into consideration when grading the homework SET #