M-6P General Physics Week 16 1/23

A B

$\langle 5\hat{i} + 4\hat{j} \rangle$ $\langle -3\hat{i} + 5\hat{j} \rangle$

A + B

x comp	y comp
$5\hat{i} + (-3\hat{i})$	$4\hat{j} + 5\hat{j}$
$2\hat{i}$	$9\hat{j}$

component vector: $\langle 2\hat{i} + 9\hat{j} \rangle$

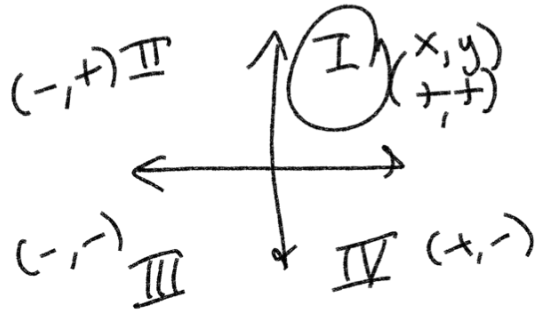
resultant: $r = \sqrt{x^2 + y^2}$

direction: $\sqrt{(2)^2 + (9)^2} = \sqrt{4 + 81} = \sqrt{85}$

$= 9.2$

$\theta = \tan^{-1}\frac{y}{x}$

$\tan^{-1}\frac{9}{2} = 77.5^\circ$



9.2, 77.5°

A $< 6\hat{i} + 4\hat{j} - 8\hat{k} >$

B $< -3\hat{i} + 3\hat{j} >$

C $< -9\hat{i} - 4\hat{k} >$

$A + B + C$

$\hat{i}$: $6\hat{i} + (-3\hat{i}) + (-9\hat{i})$

$-6\hat{i}$

$\hat{j}$: $4\hat{j} + 3\hat{j} = 7\hat{j}$

$\hat{k}$: $-8\hat{k} + (-4\hat{k}) = -12\hat{k}$

Component (unit vector)

Resultant

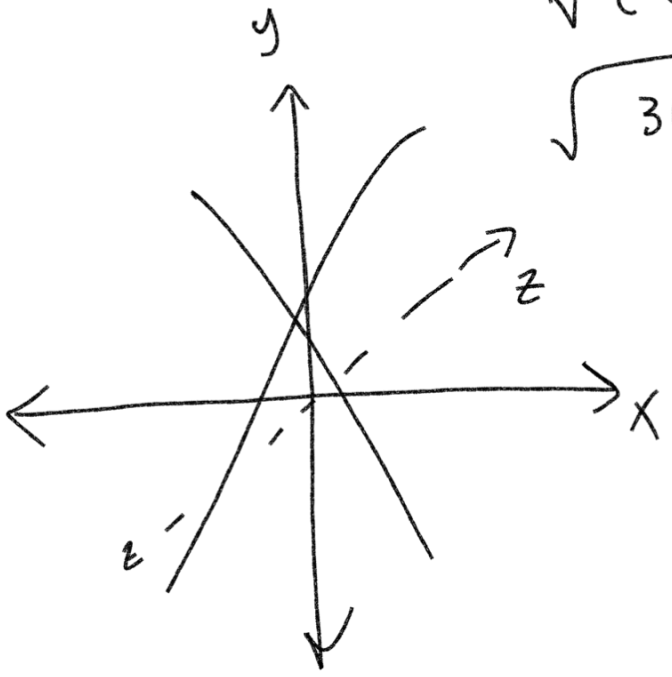
Graph.

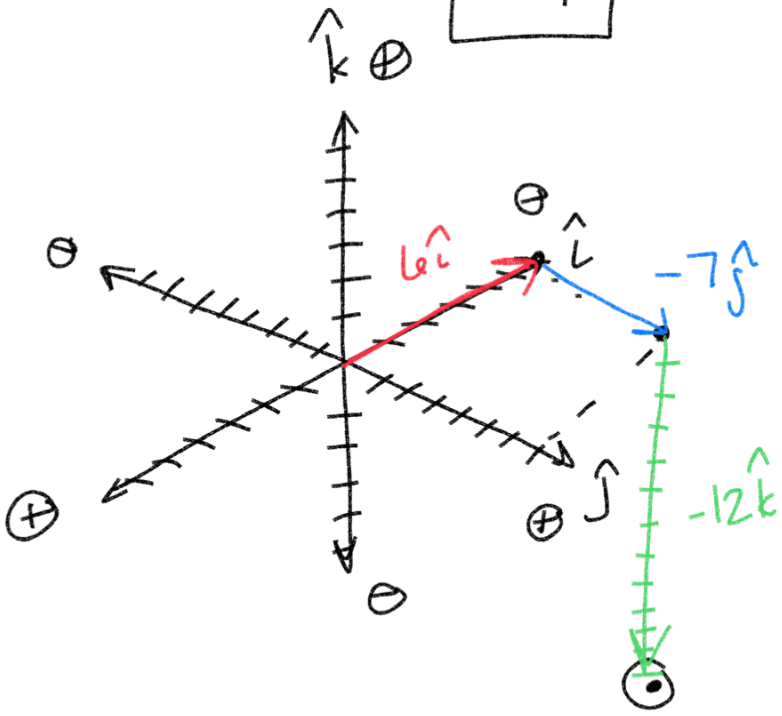
$$\boxed{< -6\hat{i} + 7\hat{j} - 12\hat{k} >}$$

$$\sqrt{(-6)^2 + (7)^2 + (-12)^2}$$

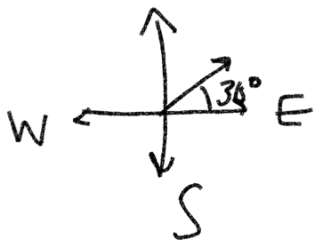
$$\sqrt{36 + 49 + 144} = \sqrt{229}$$

$$= \boxed{15.1}$$





Clara (scooter) is looking for a place to deposit Nate's body. From her car (which she drove illegally) she traveled (A) 5.2 miles in a direction 30° North of east and then headed south for (B) 3.5 miles. Finally, she turned (C) 40° West of South and traveled 8 miles. How did Clara kill Nate?



(A) 5.2 mi 30° N of E

5.2 mi, 30°

$X = r\cos\theta = 5.2\cos 30° = 4.5 \text{ miles}$

$y = r\sin\theta = 5.2\sin 30° = 2.6 \text{ miles}$

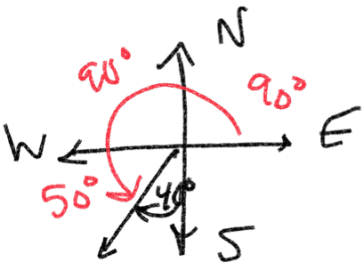
(B) south 3.5 mi

$y = -3.5$ mi

(C) 230°

40° West of South

8 mile



$X = r\cos\theta = 8\cos 230° = -5.1$ mi

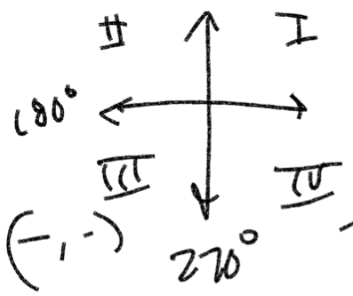
$y = r\sin\theta = 8\sin 230 = -6.1$ mi

x	y
4.5	2.6
−5.1	−3.5
−0.6	−6.1
	−7

$\langle -0.6\hat{i} + -7\hat{j} \rangle$

$$r = \sqrt{(-0.6)^2 + (-7)^2} = \sqrt{0.36 + 49} = \sqrt{49.36}$$

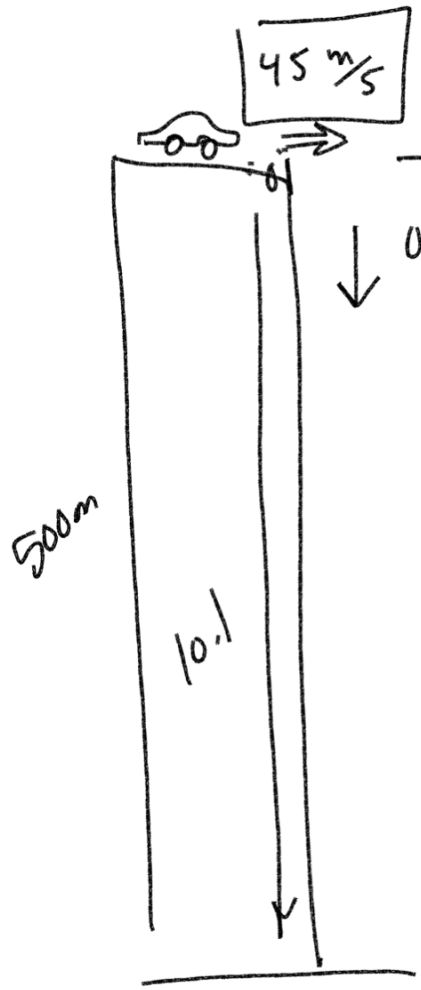
$= 7$ mi



$$\theta = \tan^{-1}\left(\frac{-7}{-0.6}\right) = 85.1°$$

$$\frac{180}{265.1°}$$

7 mi, 265.1°



45 m/s initial velocity is 0 m/s

Behave as if it was dropped

No Air Resistance

$$y = y_0 + v_{0y}t + \frac{1}{2}at^2$$

$$500 + 0 + \frac{1}{2}(-9.8)t^2$$

$$0 = 500 - 4.9t^2$$

$$-500 \quad -500$$

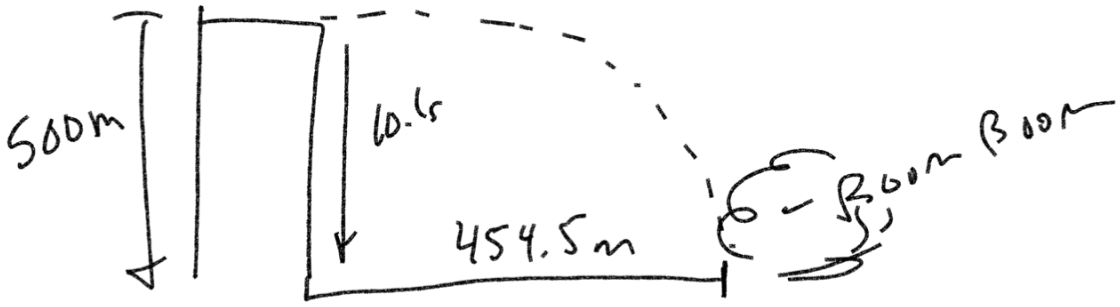
$$\frac{-500}{-4.9} = \frac{-4.9t^2}{-4.9}$$

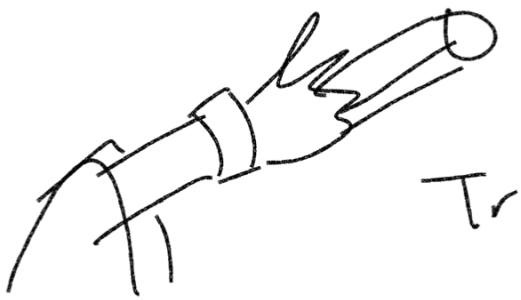
$$\sqrt{t^2} = \sqrt{\frac{500}{4.9}}$$

$$t = 10.1\text{ s}$$

$$x_f = \cancel{x_0}^{0} + v_x t$$

$$x_f = 45t = 45\frac{m}{s}(10.1\text{s}) = 454.5\text{ m}$$





Trig

$$X = r\cos\theta$$

$$V_{0x} = V_0 \cos\theta$$

$$V_{0y} = V_0 \sin\theta$$