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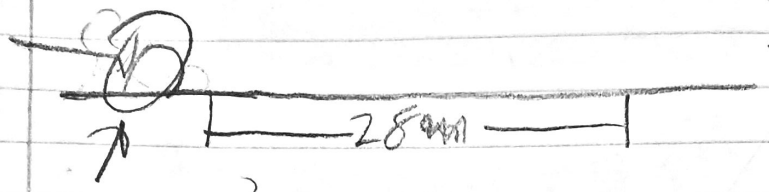
San Diego

Bonus
10-13-20
Qtr HA

Midterm #1

7.



$W = 20\,kg$
$x = 30\,m$
$x_0 = 2$
$V = 2$
$V_0 = 0\,m/s$

weight $\vec{F_g}$
normal $\vec{n}$
kinetic friction

$a = \frac{\Delta V}{\Delta t}$ $\Delta t\, a = \Delta V$ $\Delta t = \frac{\Delta V}{a}$

a) $W = 20\,kg$ $W = mg$
$x_0 = 20\,m$ $m = \frac{W}{g}$ $\frac{20}{9.8} \approx$
$x_f = ?$ $t_0 = 0$
$V_0 = 5\,m/s$ $t_1 = ?$
$V_f = 20\,m/s$
$a = -1.3\,m/s^2$

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$x_1 = x_0 + V_0 t + \frac{1}{2} a t^2$

$\frac{V_0}{a} \frac{5}{-1.3} = 3.84\,s$ $x_1 = 0 + 5(3.84) + \frac{1}{2}(-1.3)(3.84)$

$x_1 = 19.2 - 9.6$ → distance traveled until time target

$\frac{m/s}{m/s^2}$

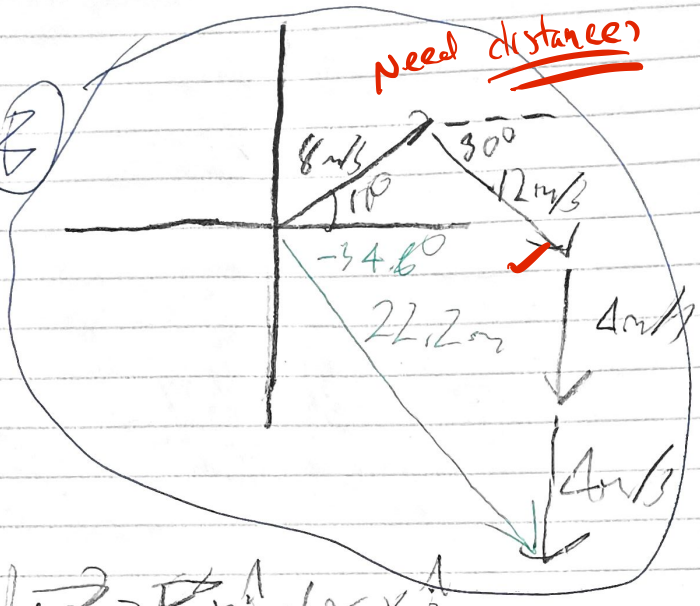
$x_1 \approx 28.846\,m$ (a)

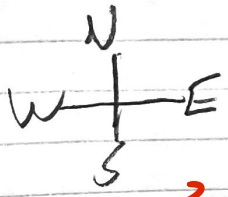
$a = \frac{\Delta V}{\Delta t} \Rightarrow \Delta t\, a = \Delta V \Rightarrow \Delta t = \frac{\Delta V}{a}$ (b)

* Use can't have negative time

$t = \frac{5\,m/s}{1.3\,m/s^2}$ $t \approx 3.846\,s$

8.





$\vec{r} = \vec{v} \cdot t$

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a) $\vec{r} = r_x \hat{i} + r_y \hat{j}$

$\vec{v}_1$ $r_{1x} = 8\cos(110°) = 2.736\,m$
$r_{1y} = 8\sin(110°) = 7.518\,m$

$\vec{v}_2$ $r_{2x} = 12\cos(330°) = 10.39$
$r_{2y} = 12\sin(330°) = -6$

$\vec{v}_3$ $r_{3x} = 8\cos(270°) = 0$
$r_{3y} = 8\sin(270°) = -8$

$\vec{r}_1 = 2.736\hat{i} + 7.518\hat{j}$
$\vec{r}_2 = 10.39\hat{i} + (-6)\hat{j}$
$\vec{r}_3 = 0\hat{i} + (-8)\hat{j}$

a

c) $2.736 + 10.39 + 0 \approx 16.27$ m (i)

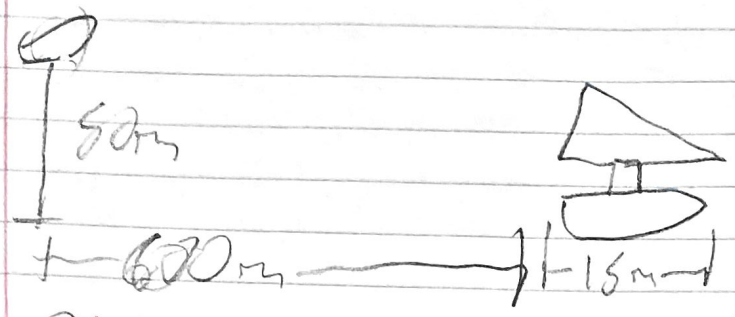
$7.518 + (-6) + (-8) \approx -12.6$ m $\theta = \tan^{-1}\left(\frac{-12.6}{16.27}\right)$

$\sqrt{16.27^2 + 12.6^2} \approx 22.2$ $\quad -34.6°$

c) → 22.2 m, -34.6°

9.

b



What are x_0, v_{ox} ? v_{oy}, a_{ox} ? a_{oy}

a) $x(t) = x_0 + v_{ox}(t_1 - t_0) + \frac{1}{2}a_{ox}(t_1 - t_0)^2$

a) $v(t) = v_0 + v_{0x}(t_1 - t_0) + \frac{1}{2}a_{ox}(t_1 - t_0)^2$

b) $v_x(t) = v_{ox} + a_{ox}\Delta t$

$v_x(t) = v_{ox} + a_x \Delta t$

b

c) $v_{0x} \cos(65°) = 135.9 \text{ m/s}$ $\quad v_{0y} \sin(65°) = 67.3$

$x(t) = 0 + 135.9(4.5) + \frac{1}{2}(\cancel{0})(4.5)^2$

$= 611 \text{ m}$

$50 + 67.3(4.5) + \frac{1}{2}(-9.8)(4.5)^2$

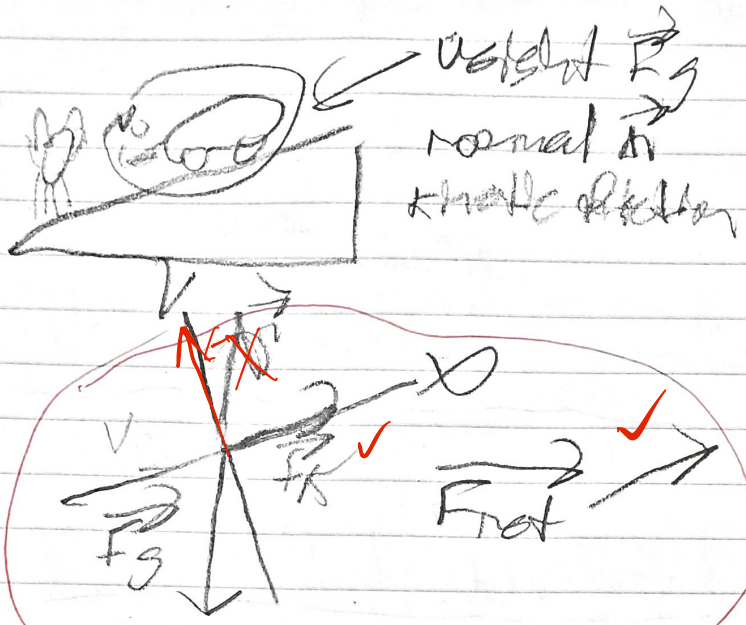
-99.225

$= 136 \text{ m}$

c) No, the cannonball does not hit the ground at the trajectory is too high & hit the ground.

P1

a)



b

(A)

b) $F = ma$ $W = mg = 1280\,kg \cdot 9.8\,m/s^2$

$F = 1280(a)$

$a = \frac{\Delta V}{\Delta t}$ $\frac{20\,m/s}{2.5\,s} = 8\,m/s^2$

$= 1280(8)$

$F = 1280(8) = 10{,}000\,N$ (B)