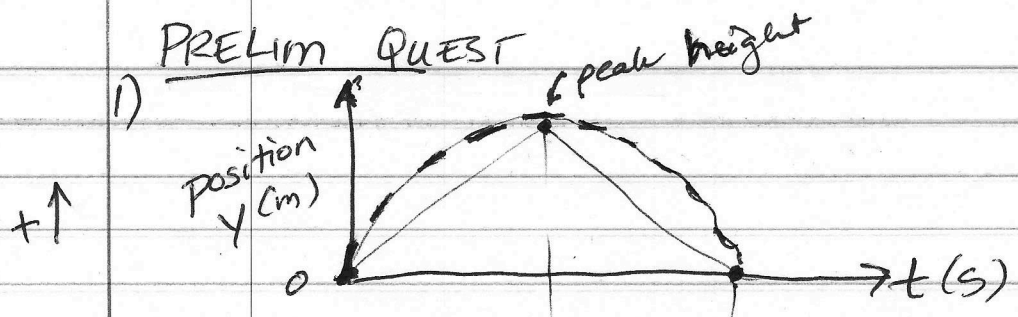
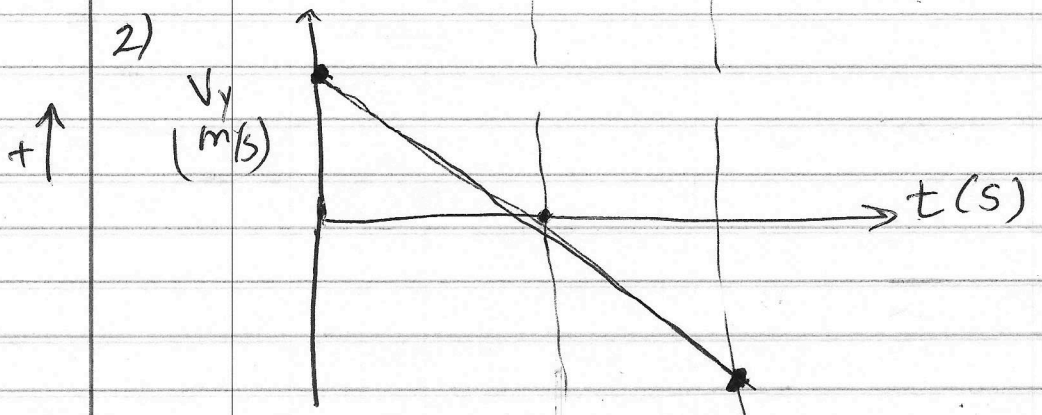
NOTES ON BALL TOSS LAB

PRELIM QUEST

1)

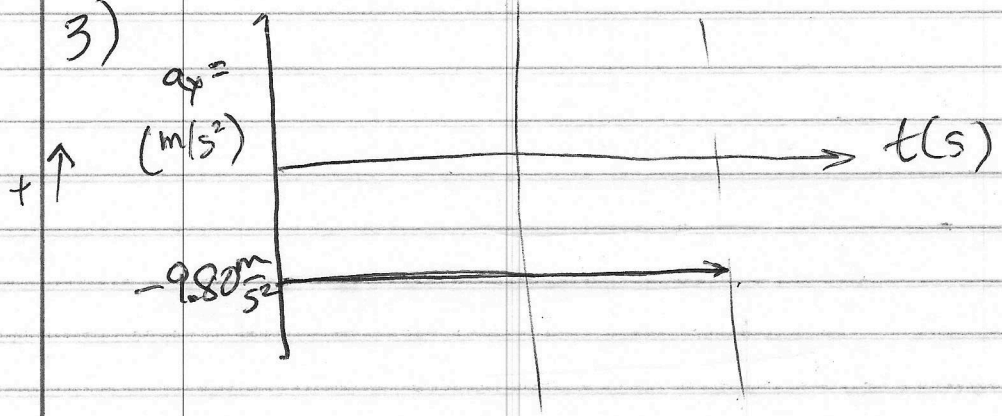


2)



slope = $\frac{\Delta y}{\Delta x}$

3)



QUESTIONS - STUDY CURVES & LABEL

1) →

2) $y = \frac{1}{2}gt^2 + v_0t + y_0$

same Alg [$y = y_0 + v_0t + \frac{1}{2}at^2$]

Free fall
$a = -9.80 \frac{m}{s^2}$
$= g \downarrow$

$y = Ax^2 + Bx + C$

here x axis is independent variable t

$y = At^2 + Bt + C$

$y = \boxed{-4.704}t^2 + 7.256t - 2.287$

2) Done

3) How close is $\underbrace{-4.704}_{\text{measured value}}$ to $\underbrace{\tfrac{1}{2}g = \tfrac{1}{2}(-9.80\ m/s^2)}_{\text{actual value}}$

$\tfrac{1}{2}g = -4.90\ m/s^2$

$$\%\text{ error} = \left| \frac{\text{measured value} - \text{actual value}}{\text{actual value}} \right| \times 100\%$$

$$\%\text{ error} = \left| \frac{(-4.704) - (-4.90)}{-4.90} \right| \times 100\%$$

$$\boxed{\%\text{ error} = 4\%\text{ error}}$$ based on quadratic curve fit of y vs. t

4) → Straight line for v vs. t means constant acceleration

$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} \text{ but } \frac{v_2 - v_1}{t_2 - t_1} \text{ or } \frac{\Delta v}{\Delta t} = a$$

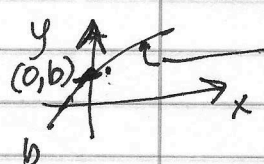
(Greek letter "delta")

→ Const slope → acceleration of gravity during free fall (after leaves hands until just before it is caught)

g

5) Done

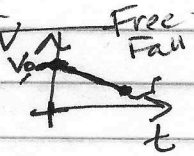
6) Remember from algebra



$y = mx + b$ equation for a line

slope, y-intercept

$v = mt + b$ $\quad v = v_0 + at$



$v = -9.403\ m/s^2 \cdot t + 7.253\ m/s$

How does $-9.403\ m/s^2$ compare to $g = -9.80\ m/s^2$

$$\%\text{ error} = \left| \frac{\text{measured} - \text{actual}}{\text{actual}} \right| \times 100\%$$

$$= \left| \frac{-9.403 - (-9.80)}{-9.80} \right| \times 100\%$$

$\%\text{ error} = 4.05\%$ ← From linear fit of v vs. t graph

7) done

8) mean $= -9.420\ m/s^2$

$$\%\text{ error} = \left| \frac{\text{meas} - \text{act}}{\text{act}} \right| \times 100\%$$

$$= \left| \frac{[-9.420 - (-9.80)]}{-9.80} \right| \times 100\%$$

$\%\text{ error} = 3.88\%$ ← From average of a vs.t during ~~freefall~~

This average (mean) acceleration was slightly closer to g than other 2 methods.

9) For v vs t → 1/2 g ~ -4.704
$\pm 9.408\ m/s^2$

v vs t $-9.403\ m/s^2$

a vst $-9.420\ m/s^2$

air resistance or drag or friction

SKIP EXTENSIONS, QUES. 2, 5 7

DATA TABLE -insert

Curve Fit Parameters	A	B	C
Dist (Ax^2+Bx+C)	-4.704	7.256	-2.287
Vel ($Ax+B$)	-9.403	7.253	///
Accel (Mean)	-9.420	///	///