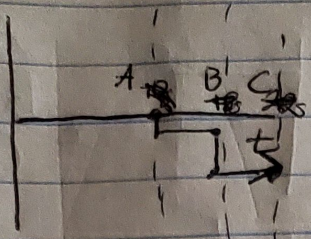
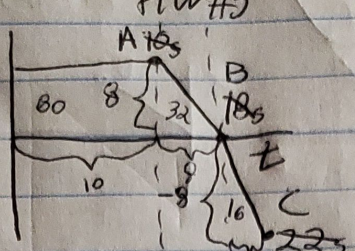
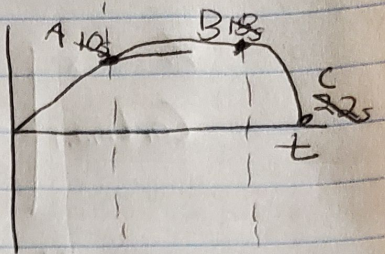
PHYS 407

HW #3

1.a





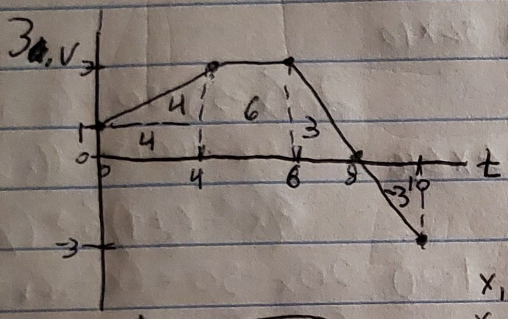


a. (10,0) b. (18,-1) c. (22,-2) A(10,8) B.(18,0) C.(22,-8) A(10,80) B(18,112) C(22,96)

2.

96 meters

3.



$x_1 = 0, y_1 = 1$
$x_2 = 4, y_2 = 3$
$\frac{3-1}{4-0} \rightarrow \frac{2}{4} = 0.5$

a. $0.5\ m/s^2$

b. 14 meters $\quad 4+4+6+3-3=14$

4.

5. yes $\quad a = 3t \rightarrow \frac{1}{2}(3t)t^2 + v_i t = \frac{3}{2}t^3 + v_i t = \Delta x$

6. $\Delta x = \frac{1}{2}at^2 + v_i t + c, \quad a = -9.8\ m/s^2, \quad V_i = 30\ m/s, \quad c = 0$

$\frac{1}{2}(-9.8)t^2 + 30t + 0$

a. apex: 45.92 meters

b. time: 6.19 seconds; The equation has 2 roots but one of them have a negative x-coordinate, which means that it can be ignored in this context

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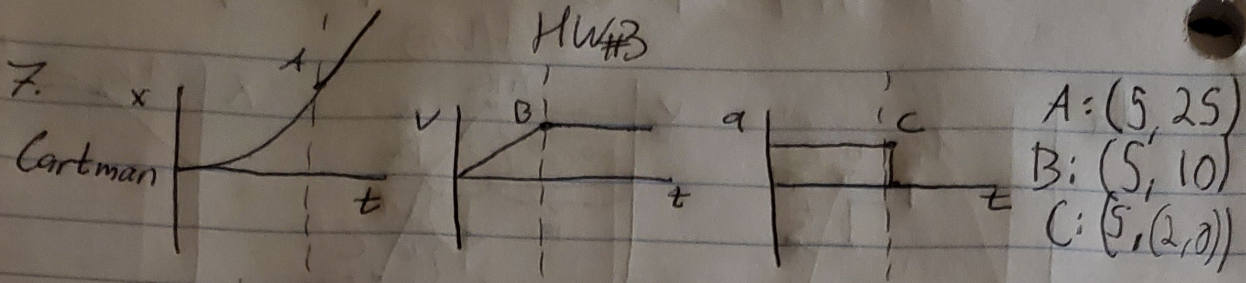
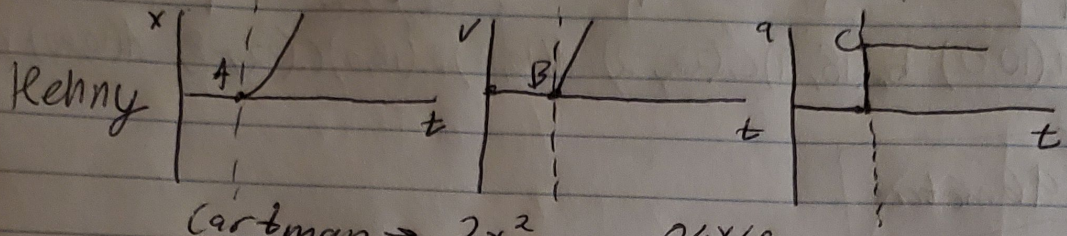
7.





Cartman → $2x^2$ $0 \le x \le 5$

$20(x-5)+50$ $5 \le x \le 10$

Kenny → $6(x-3)^2$ $3 \le x \le 10$

$(20x-50)+(6x^2-36x+54)=100$

$6x^2-16x+4=100 \rightarrow 6x^2-16x-96=0$

$20(x-5)+50=6(x-3)^2$

$20x-100+50=6(x-3)(x-3)$

$(x^2-6x+9)6 \rightarrow 6x^2-36x+54$

$20x-50=6x^2-36x+54$

$6x^2-56x+104=0$

$x = 9.55$ seconds

Kenny is going ~~39.02 m/s~~ 15.3 m/s when he collides with Cartman.

$V_f = V_i + at$, $V_i = 0$, $a = 6 m/s^2$, $\Delta t = 5.55 - 3 = 2.55 s$

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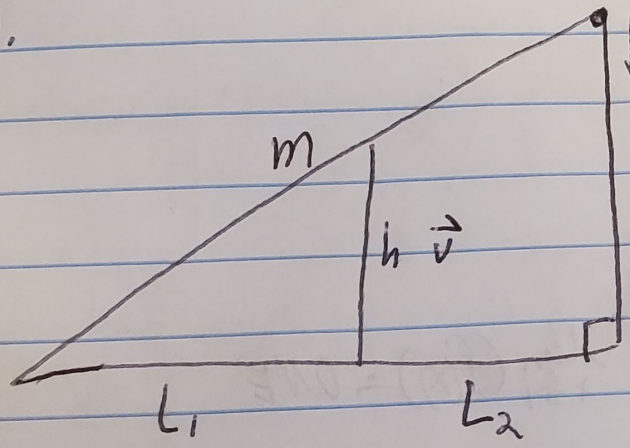
4.



$L_1 + L_2 = L$ $\quad m = h/vt$

$L_1 = vt$

$L_2 = L - vt$

$V_s = \frac{dH}{dt}$

$H(t) = Lm = Lh/vt$

$V_s(t) = H'(t) = -Lh/vt^2$