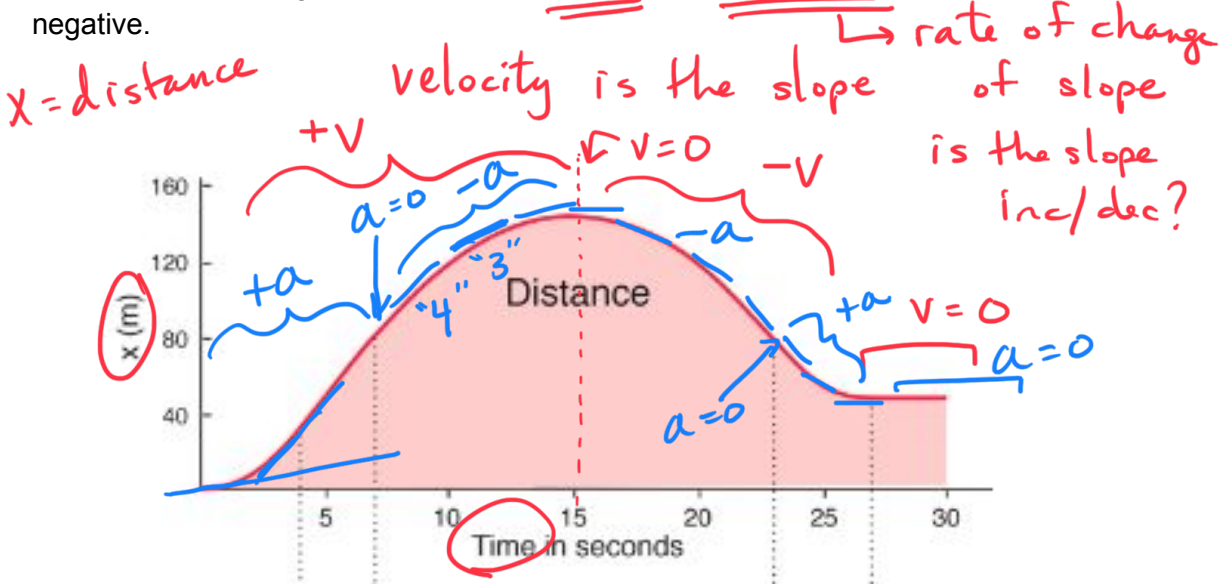
9.) (3 pts) Evaluate the graph. Label where velocity and acceleration are either positive or negative.



10.) (20 pts total, 4 pts each) Solve each. For each scenario, assume acceleration is constant. *Term breakdown will not appear on actual exam!*

a) An ambulance is 40.0 m from the hospital and heading away from it. If it starts at 3.50 m/s and accelerates at a rate of 2.80 m/s^2, how far away from the hospital will it be in 55.0 s?

$x_i = 40.0\ m$	$v_i = 3.50\ m/s$	$a = 2.80\ m/s^2$	$t = 55.0\ s$

x_f

How far away → x_f x_i v_i a t

$$x_f = x_i + v_i t + \frac{1}{2}at^2$$

x_f

$$40.0\,m + (3.50\,m/s)(55.0\,s) + \frac{1}{2}(2.80\,m/s^2)(55.0\,s)^2$$

4467.5 m

4470 m

b) A helicopter starts 125 m away from base at 6.60 m/s. How fast is it traveling when it reaches its destination 795 m away from base if it experienced a constant acceleration of 1.35 m/s^2?

$x_i = 125\ m$ $x_f = 795\ m$ $v_i = 6.60\ m/s$ $a = 1.35\ m/s^2$

V_f = ? x_i x_f v_i a units → m/s

$$(V_f)^2 = (V_i)^2 + 2a(x_f - x_i)$$

$$V_f = \sqrt{(6.60)^2 + 2(1.35)(795-125)} = 43.0\ m/s$$

c) A train is travelling within an initial velocity of 32.0 m/s. If it accelerates at 1.50 m/s^2, what is its final velocity in 24.0 s?

$v_i = 32.0\ m/s$ $a = 1.50\ m/s^2$ $t = 24.0\ s$

V_f V_i a t

$$V_f = V_i + at$$

$$32.0 + (1.50)(24.0) = 68.0\ m/s$$

d) A jet takes off 300. m away from the launch site travelling in the opposite direction at 85.0 m/s. In 38 seconds, the jet is now moving at 112 m/s. How far away from the launch site is it now?

$v_f = 112\ m/s$ $v_i = 85.0\ m/s$ $x_i = 300\ m$ $t = 38.0\ s$

$$X_f = X_i + \frac{1}{2}(V_i + V_f)t$$

$$300 + \frac{1}{2}(85 + 112)(38.0) = 4043\ m$$

4040 m

e) A car passes the first check point traveling 65.0 mi/hr. If it passes the second check point at 83.0 mi/hr, what is its average velocity if acceleration is constant?

$v_i = 65.0\ mi/hr$ $v_f = 83.0\ mi/hr$

$$\frac{V_i + V_f}{2} = \frac{65.0 + 83.0}{2} = 74.0\ mi/hr$$

11.) (20 pts total, 4 pts each) A penny is thrown straight *upward* from the top of a building at a velocity of 16.0 m/s. If the building is 264 m tall, find each of the following. (Use t = 0 as the time the penny leaves the thrower's hand. Also, there is no need to include thrower's height.)

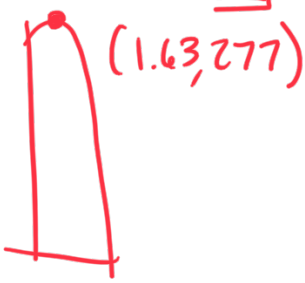
$y_f = y_i + v_i t + \frac{1}{2}at^2$

$y_f = 264 + 16t - 4.9t^2$

a) What is the maximum height?

$264 + 16(1.63s) - 4.9(1.63)^2$

277m



b) At what time does the penny reach its maximum height?

At max height $v_f = 0$

$v_f = v_i + at$

$0 = 16 + (-9.8)t$

$-16 \quad -16$

$\frac{-16}{-9.8} = \frac{-9.8t}{-9.8}$

$t = 1.63s$

c) At what time does the penny return to the height from which it was thrown?

$1.63s + 1.63s = 3.26s$

d) What is the velocity of the penny just prior to impact? $v_f = ?$

Find the time to impact

$v_f = v_i + at$

$16 + (-9.8)(9.15)$

-73.7 m/s

v_i a t

$264 + \frac{1}{2}($ $y_f = y_i + t\frac{(v_i+v_f)}{2}t$

e) What is the velocity and position of the penny at t = 3.00 s.

Velocity

$V_f = V_i + at$

$16 + (-9.8)(3)$

$-13.4\ m/s$

$\rightarrow y_f = y_0 + v_i t + \frac{1}{2}at^2$

$264 + 16(3) + \frac{1}{2}(-9.8)(3)^2$

268 m

12.) (12 pts total, 4 pts each) While being chased by the authorities, Jackson drives his car off a 76 m tall cliff. If he is traveling at 7.50 m/s at the time he drives off the cliff, find each of the following. (Assume v_{iy} = 0 m/s and no air resistance.)

a) How long until the car impacts the cushiony ground below? (No Jacksons were harmed in the making of this problem.)

b) How fast is the car traveling in the y direction after 2.50 s?

c) How far from the base of the cliff will the car land?

With constant acceleration

$$v_{xf} = v_{xi} + a_x t$$

$$Av\ v_x = \frac{v_{xi} + v_{xf}}{2}$$

$$x_f = x_i + \frac{1}{2}(v_{xi} + v_{xf})t$$

$$x_f = x_i + v_{xi}t + \frac{1}{2}a_x t^2$$

$$v_{xf}^2 = v_{xi}^2 + 2a_x(x_f - x_i)$$

1 inch = 2.54 cm