Name: _____ **Date:** _____ **#65 Vertex form word problems**

For each problem tell which point(s) you need to find (x – ints, y-int, vertex…which part, or some other point) THEN solve.

1. The equation for a small rocket that is ***h (height)*** feet in the air of a small rocket ***t* seconds** after it is launched is $h(t) = -16(t-4)^2 + 256$.

   a. How long is the rocket in the air? 8 sec.
   h(t)>0 so farther xint

   b. What is the greatest height the rocket reaches? 256 ft.
   vertex y coord. (4, 256)

   c. About how high is the rocket after 1 second? 112 feet
   h(1)

   d. After 2 seconds, is the rocket going up or going down? up Explain. the graph inc. from $(-\infty, 4)$
   is h(2) before or after the vertex

   e. After 5 seconds, is the rocket going up or going down? down Explain. the graph decreases (4,
   is h(5) before or after the vertex

   f. Do you think the rocket is traveling faster from 0 to 1 second or from 3 to 4 seconds? Explain your answer. Find speed (slope) from 0 to 1 & from 3 to 4

2. A rocket carrying fireworks is launched from a hill 80 feet above a lake. The rocket will fall into the lake after exploding at its maximum height. The rocket's **height (*h*)** above the surface of the lake after ***t* seconds** is given by $h(t) = -16(t-2)^2 + 144$. vertex (2, 144)

   a. When will the rocket explode? after 2 sec.
   time x part of vertex

   b. At what height will the rocket/fireworks explode? 144 ft in the air
   y part of vertex

   c. When will the spectators hear the rocket fall into the lake? after 5 sec.
   height of zero so farther x int (assuming splash & hearing splash are simultaneou

   d. How long will it take for the rocket to hit 128 feet?
   find h(t) = 128

   after 1 sec.

3. Al is an avid daredevil skateboarding fanatic. His most recent trick involves doing a 720 off a ramp on the roof of a building landing in a pillow truck on the street below. The equation of his flight off the ramp is $h(d) = -5(d-3)^2 + 80$ where ***h*** is the **height** in yards and ***d*** is the **horizontal distance** in yards.

a. How tall is the building that Al skateboarded off?

started jump
needy int

35 yds tall

b. How far from the building was the pillow truck placed?

dist. from building
til hit ground
need farther x int

7 yds

c. How long was Al in the air?

No way to tell
b/c time wasn't
a measured variable

d. What was the maximum height that Al reached?

y part of
vertex
(3, 80)

80 yds

HW #65

1a $0 = -16(t-4)^2 + 256$

$-256 \qquad -256$

$-256 = -16(t-4)^2$

$\frac{-256}{-16} = \frac{-16(t-4)^2}{-16}$

$\sqrt{16} = \sqrt{(t-4)^2}$

$\pm 4 = t-4$

$t-4=4$ or $t-4=-4$

$+4\ +4 \qquad +4\ +4$

$\boxed{t=8} \qquad \boxed{t=0}$

$t=0$: started on the ground

$t=8$: hit the ground after 8 sec

1c $h(1) = -16(1-4)^2 + 256$

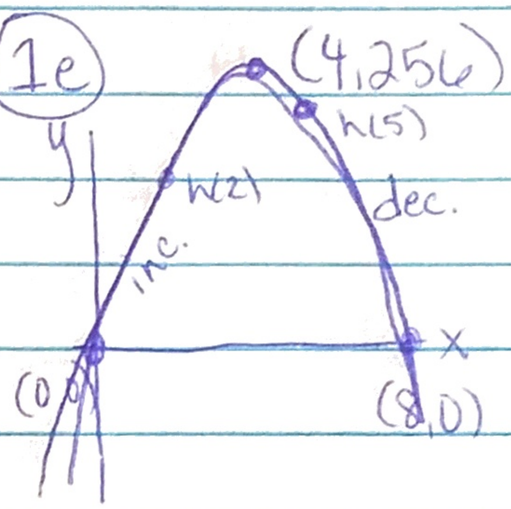
$= -16(-3)^2 + 256$

$= -16(9) + 256$

$= -144 + 256$

$= 112$

1d & 1e



1f $h(0) = 0$ from part a

$h(1) = 112$ from part b

$\frac{ft}{sec}\ \frac{112-0}{1-0} = \frac{112}{1}$

$h(3) = -16(3-4)^2 + 256$

$= -16(-1)^2 + 256$

$= -16(1) + 256$

$= -16 + 256$

$= 240$

$h(4) = 256$ from vertex

$\frac{ft}{sec} = \frac{256-240}{4-3} = \frac{16}{1}$

It is traveling faster from 0 to 1 sec. b/c 112 ft/sec > 16 ft/sec

2c $0 = -16(t-2)^2 + 144$

$-144 \qquad -144$

$\frac{-144}{-16} = \frac{-16(t-2)^2}{-16}$

$\sqrt{9} = \sqrt{(t-2)^2}$

$\pm 3 = t-2$

$t-2=3$ or $t-2=-3$

$+2\ +2 \qquad +2\ +2$

$\boxed{t=5} \qquad \boxed{t=-1}$

$t=5$: when it fell to ground

$t=-1$: time can't be negative

2d $128 = -16(t-2)^2 + 144$

$-144 \qquad -144$

$\frac{-16}{-16} = \frac{-16(t-2)^2}{-16}$

$\sqrt{1} = \sqrt{(t-2)^2}$

$\pm 1 = t-2$

$t-2=1$ or $t-2=-1$

$+2\ +2 \qquad +2\ +2$

$\boxed{t=3} \qquad \boxed{t=1}$

$t=3$: it exploded at 2 sec.

$t=1$: when it's at 128 ft

(3a) $h(0) = -5(0-3)^2 + 80$

$= -5(-3)^2 + 80$

$= -5(9) + 80$

$= -45 + 80$

$= 35$

(3b) $0 = -5(d-3)^2 + 80$

$-80 \qquad -80$

$\frac{-80}{-5} = \frac{-5(d-3)^2}{-5}$

$\sqrt{16} = \sqrt{(d-3)^2}$

$\pm 4 = d-3$

$d-3=4$ or $d-3=-4$

$+3\ +3 \qquad +3\ +3$

$d=7$ $\qquad$ $d=-1$

where ~~truck~~ is

if he went backwards he'd still be on the building