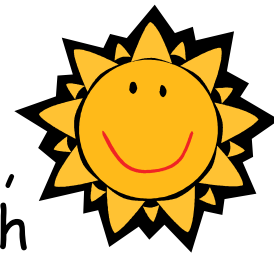


Unit 2 Day 4

Designing Parabolas & Quiz

Warm Up



For the following two equations, find the following values, showing your work for finding them by hand! Then sketch the graphs on graph paper.

a.) $x^2 - x - 20 = 0$

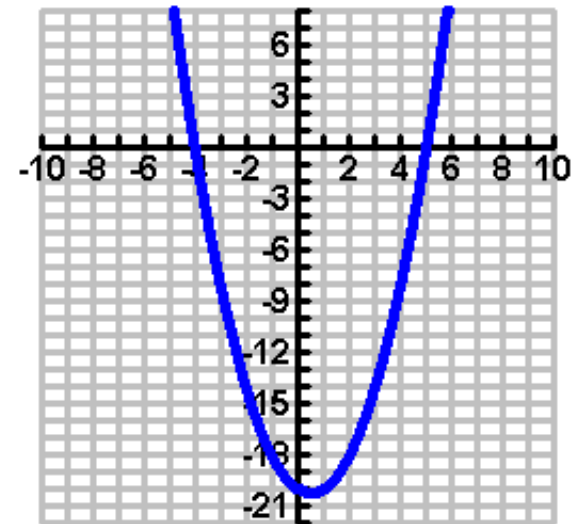
zeros: $(5, 0)$ $(-4, 0)$

vertex: $(\frac{1}{2}, -20\frac{1}{4})$

y-intercept: $(0, -20)$

Max/min?: **Minimum**

Axis of Symmetry (AoS): $x = \frac{1}{2}$



b.) $x^2 + 8x + 15 = 0$

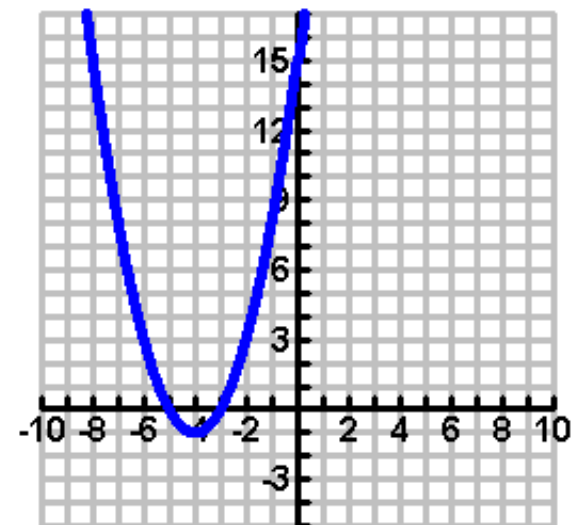
zeros: $(-3, 0)$ $(-5, 0)$

vertex: $(-4, -1)$

y-intercept: $(0, 15)$

Max/min?: **Minimum**

Axis of Symmetry (AoS): $x = -4$



Done early? Complete Factoring Practice at the bottom of Notes p. 9

Homework Answers

Function	Solutions (solve by factoring)	x-intercept locations (x,y)	y- intercept location (x,y)	Vertex location (x,y)	Axis of Symmetry	Is the vertex the maximum or minimum value of the function? Explain why.
1. $y = x^2 + 6x + 8$	$(x + 4)(x + 2)$ $x = -4, -2$	$(-4, 0)$ $(-2, 0)$	$(0, 8)$	$(-3, -1)$	$x = -3$	Minimum, $a > 0$
2. $y = 3x^2 + 6x$	$3x(x + 2)$ $x = 0, -2$	$(0, 0)$ $(-2, 0)$	$(0, 0)$	$(-1, -3)$	$x = -1$	Minimum, $a > 0$
3. $y = -x^2 + 8x - 12$	$-1(x - 6)(x - 2)$ $x = 6, 2$	$(6, 0)$ $(2, 0)$	$(0, -12)$	$(4, 4)$	$x = 4$	Maximum, $a < 0$

More Details & Steps for #1 on next slides ->

Homework Answers

Function	Solutions (solve by factoring)	x-intercept locations (x,y)	y- intercept location (x,y)	Vertex location (x,y)	Axis of Symmetry	Is the vertex the maximum or minimum value of the function? Explain why.
1. $y = x^2 + 6x + 8$	$(x + 4)(x + 2)$ $x = -4, -2$	$(-4, 0)$ $(-2, 0)$	$(0, 8)$	$(-3, -1)$	$x = -3$	Minimum

Remember to write the x-intercepts, y-intercepts, and vertex as coordinate pairs!

Remember to write the Axis of Symmetry as a line. Put the $x =$ on it!! 😊

More Details & Steps for #1 on next slide ->

Homework Answers

Function	Solutions (solve by factoring)	x-intercept locations (x,y)	y- intercept location (x,y)	Vertex location (x,y)	Axis of Symmetry	Is the vertex the maximum or minimum value of the function? Explain why.
1. $y = x^2 + 6x + 8$	$(x + 4)(x + 2)$ $x = -4, -2$	$(-4, 0)$ $(-2, 0)$	$(0, 8)$	$(-3, -1)$	$x = -3$	Minimum

To graph parabolas:

*Factor and solve to find the zeros

-> 1st and 2nd Points) Graph the x-intercepts.

*Average x-intercepts to find the x-value of the vertex

Vertex x-value = $(-4 + -2)/2 = -3$ (Also, x-value of A.o.S.)

*Substitute the vertex x-value into the equation to find the y-value of the vertex.

$$\text{Vertex y-value} = (-3)^2 + 6(-3) + 8 = -1$$

-> 3rd Point) Graph the Vertex $(-3, -1)$

*Substitute $x=0$ into the equation to find the y-value of the y-intercept

$$y = (0)^2 + 6(0) + 8 = 8$$

-> 4th Point) Graph the y-intercept $(0, 8)$

*Reflect the y-intercept (or 4th pt) across the AoS

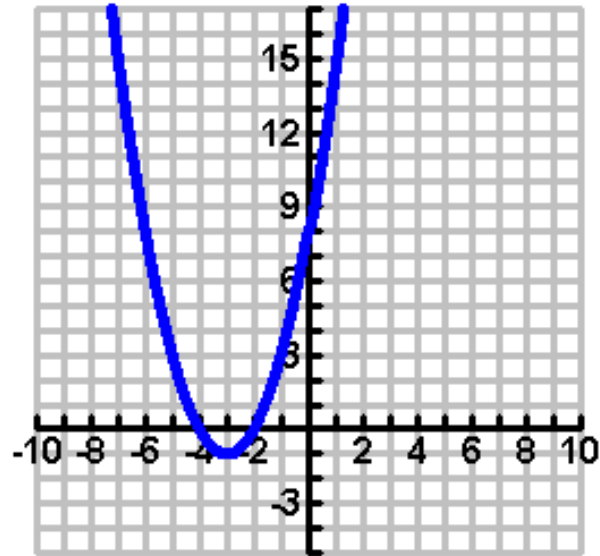
-> 5th point) "y-intercept mirror" $(-6, 8)$

Graphs
on next
slide ->

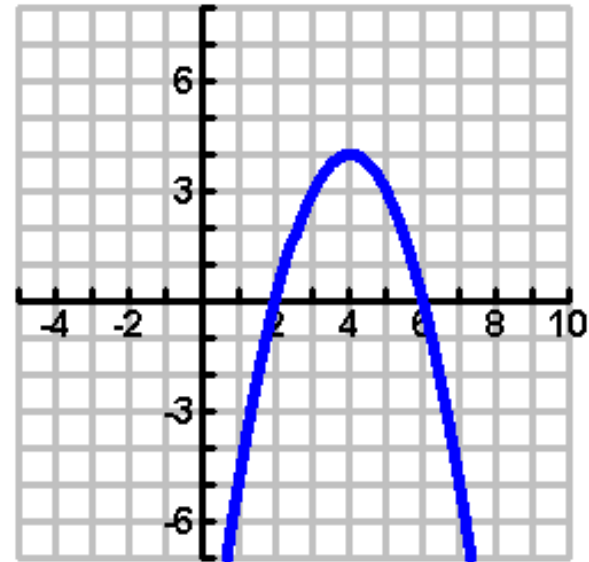
Homework Answers

Graphs of each

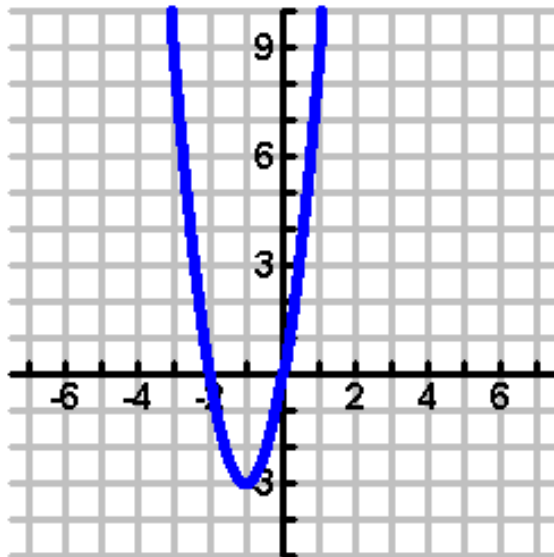
1.)



3.)



2.)



Homework Answers

4.) The equation for the motion of a projectile fired straight up at an initial velocity of 64ft/s is $h = 64t - 16t^2$, where h is the height in feet and t is the time in seconds. Find the time the projectile needs to reach its highest point. How high will it go?

Find the zeros.

$$h = 64t - 16t^2 = 16t(4 - t)$$

$t = 0, 4$ are the zeros

Find the halfway location (the vertex)

$$t = (0 + 4) / 2 = 2$$

Time at highest point is 2 seconds.

Substitute the vertex's t -value into the equation.

$$h = 64(2) - 16(2)^2 = 64$$

Height at highest point is at 64 ft.



Tonight's HW

Notes pg. ~~16-18~~

10 - 11 (top $\frac{1}{2}$)

Packet pg. 5

& Start Packet pg. 6

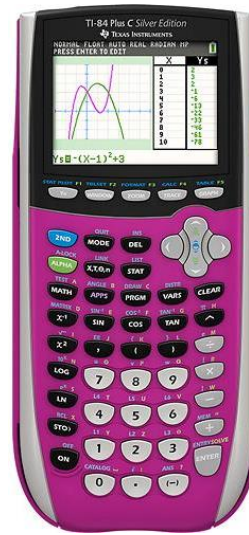
(as always, be sure to show work!)

Hint: If you get stuck on pg. 6, look back at the HW assigned for the night of the Unit 1 Test. 😊

Anyone still missing printed notes?

- Remember, if you need me to print notes for you, have your parent email me
- Printed notes are ESSENTIAL for Day 5 and 6, so if you won't be able print them, let me know! 😊

Quadratic Regression



- Stat → Edit then enter the x values into L1 and the y values into L2.

- Stat → Calc → QuadReg

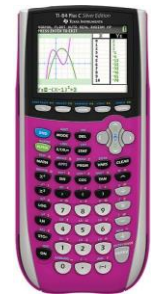
After you press QuadReg, there are two ways to finish the regression, depending on what calculator you have...

Maple sap production vs. tree age

Tree age (in years)	Sap production (in ml)
7	200
50	350
10	370
17	380
35	480
8	280
27	420
40	430
12	320
45	360
22	480
42	390
30	430
37	450

Directions continue ->

Quadratic Regression (continued)



For older calculators (if pressing QuadReg keeps you on the main screen)

After Quad Reg

Press 2^{nd} 1 to get L1,

Press 2^{nd} 2 to get L2,

Press Vars Yvars 1 1
to get Y1

****This step is KEY!!****

So your calc should say
QuadReg L1, L2, Y1

*Round to nearest
thousandth*

For newer calculators (if pressing QuadReg brings up a different screen)

On that screen be sure
X List is L1 and Y List is L2.

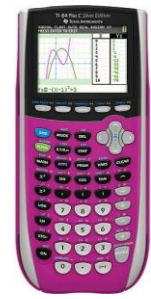
Then where it says “Store”,
do VARS Y-Vars 1 1
to get Y1

****This step is KEY!!****

$$y = -0.359x^2 + 22.032x + 119.725$$

Directions continue ->

Quadratic Regression (continued)



Maple sap production vs. tree age

- Turn on scatter plot with 2^{nd} $y =$ and Enter
- Use Zoom 9 to show your data well on the graph

Tree age (in years)	Sap production (in ml)
7	200
50	350
10	370
17	380
35	480
8	280
27	420
40	430
12	320
45	360
22	480
42	390
30	430
37	450



Applications

A rancher is constructing a cattle pen by the river. She has a total of 150 ft. of fence and plans to build the pen in the shape of a rectangle. Since the river is very deep, she needs only fence 3 sides of the pen. Find the dimensions of the pen so that it encloses the maximum area.

$$\text{Area} = xz$$

$$\text{Perimeter: } 2x + z = 150$$

$$2x + z = 150 \rightarrow z = 150 - 2x \text{ (plug into the area)}$$

$$\text{Area} = x(150 - 2x)$$

multiplies to $150x - 2x^2$ (a quadratic... with a max!)

Find the max of $y = 150x - 2x^2 \rightarrow (37.5, 2812.5)$

Dimensions: 37.5 ft by 75 ft

Largest Area = 2812.5 ft²



Practice

Practice: Factor and solve.

1. $4x^2 + 7x = 2$ $(4x - 1)(x + 2) = 0$ Factors
 $x = \frac{1}{4}, -2$ Solutions

2. $x^2 - 36 = 0$ $(x + 6)(x - 6) = 0$ Factors
 $x = -6, 6$ Solutions

3. $4x^2 + 12x - 72 = 0$ $4(x + 6)(x - 3) = 0$ Factors
 $x = -6, 3$ Solutions

4. Factor Completely: $20x^2 - 45$

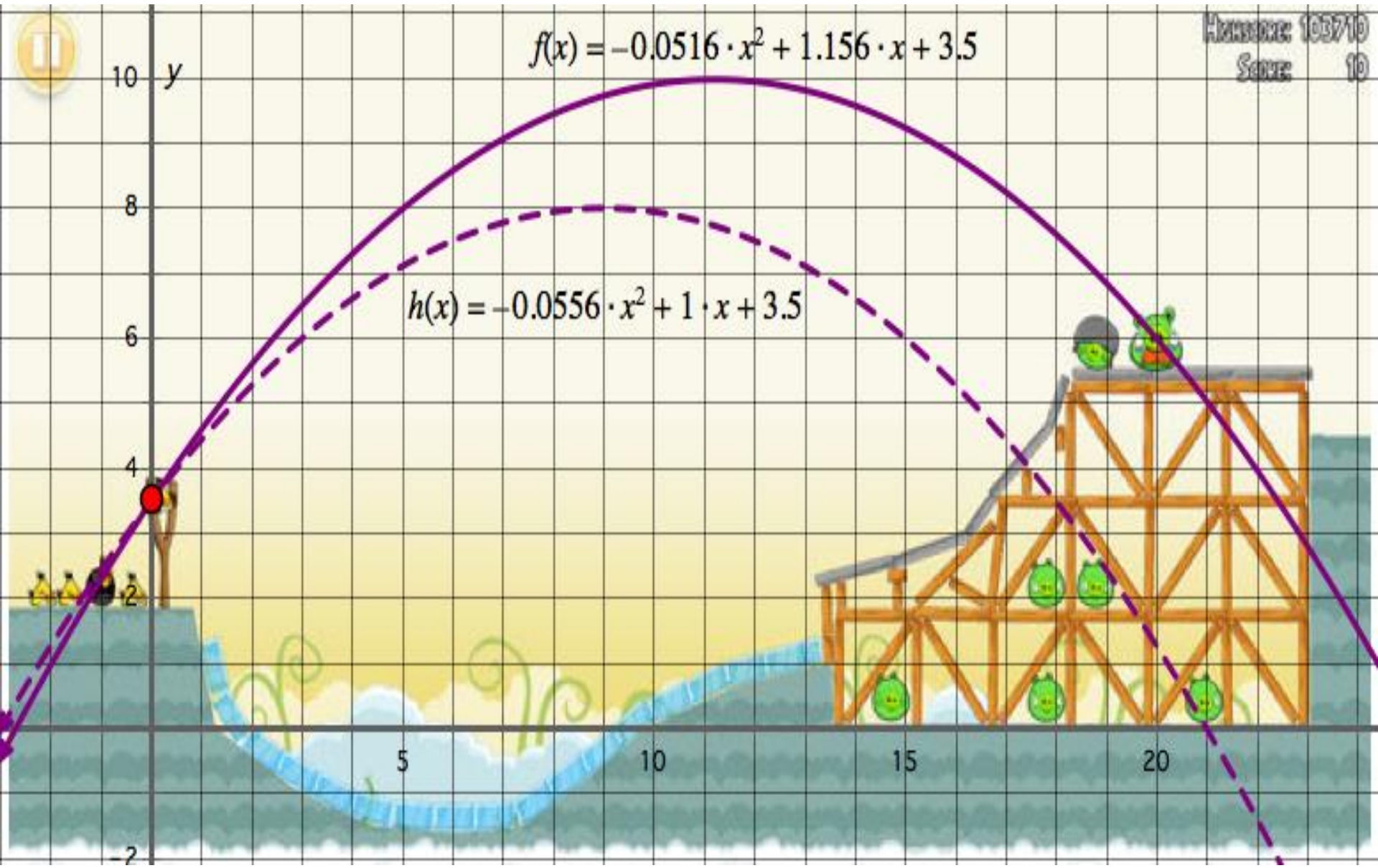
$5(4x^2 - 9)$ THEN
 $5(2x + 3)(2x - 3)$



Discovery Activity:

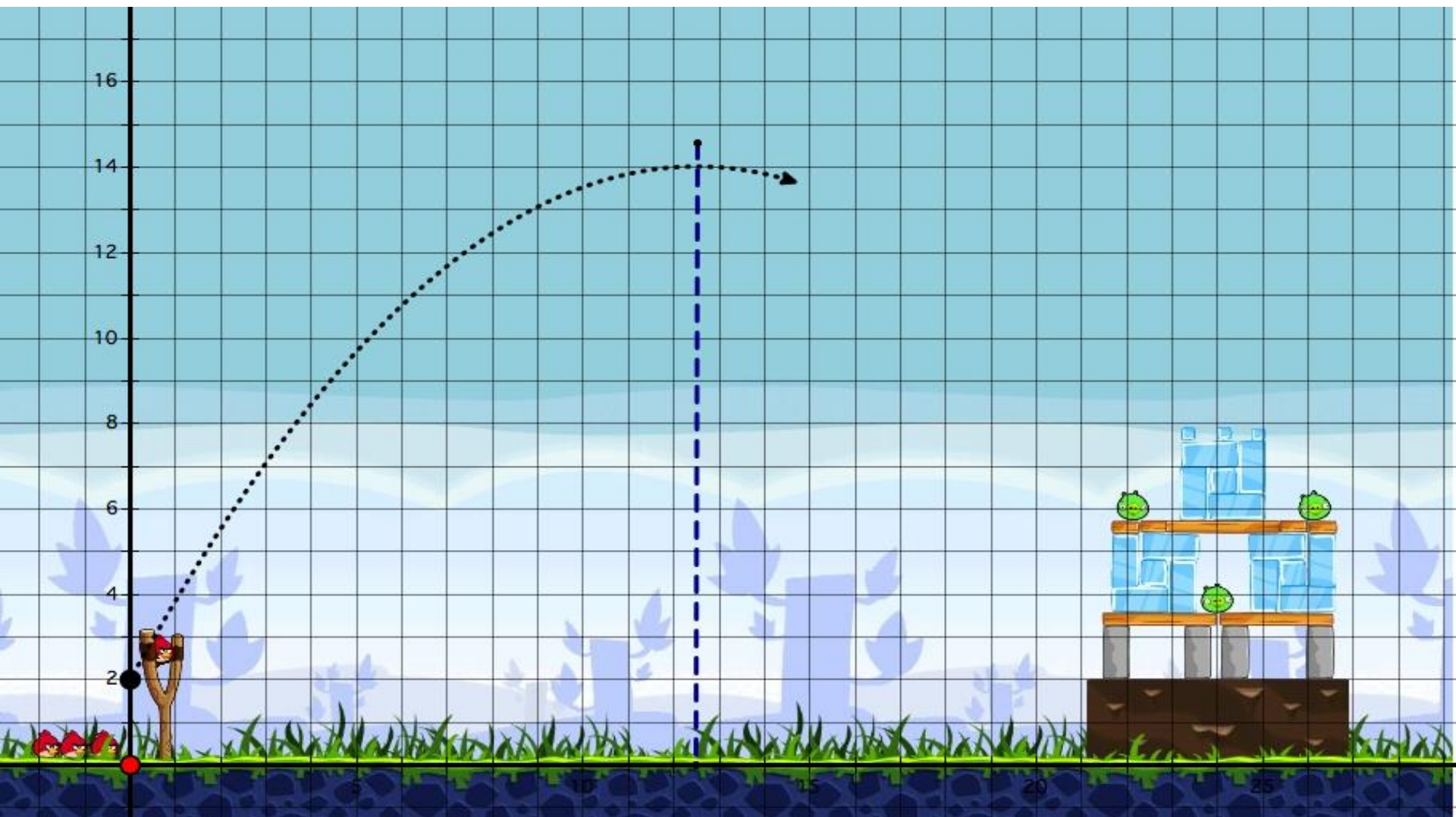
Angry Birds
Round 1

Complete for Hw





Angry Birds Round 2





Angry Birds Round 3

For #2, the equation can
be hard to read..it is
 $y = -0.083x^2 + 1.82x$





Quiz Time

When you finish, begin
on your homework:

Notes pg. ~~16-18~~

10 - 11 (top $\frac{1}{2}$)

Packet pg. 5

& Start Packet pg. 6

(as always, be sure to show work!)

Hint: If you get stuck on pg. 6, look
back at the HW assigned for the night
of the Unit 1 Test. 😊