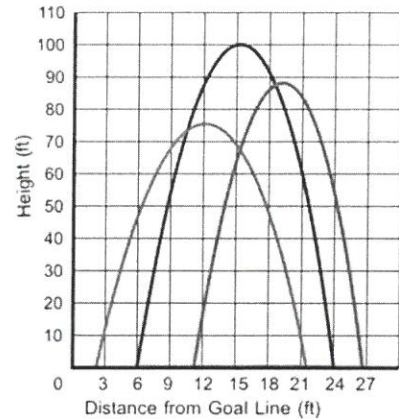


Practice

For each graph, write an equation based on the characteristics you're given. Then, explain using algebraic reasoning which graph has the greatest maximum and which egg travels the farthest.



Day 6: Characteristics of Quadratic Functions Continued as well as Even VS. Odd Functions

Warm-Up:

1. Jenna is trying to invest money into the stock exchange. After some research she has narrowed it down to two companies. Company A shows a portfolio value of $v(t) = 800 - 28t + 0.25t^2$, and Company B shows a portfolio value of $v(t) = 700 - 65t + 0.3t^2$, where v is the value of the portfolio in hundreds of dollars and t is the time in months. Which company will allow her the peace of mind of having the higher value, even if the stock prices drop to their lowest?

company A \rightarrow vertex is minimum at $(56, 16) \rightarrow$ at lowest point, Jenna has \$1600 value in portfolio after 56 months \Rightarrow Company A is best!
 company B \rightarrow vertex is minimum at $(108.3, -2820.83) \rightarrow$ at lowest point, Jenna would have lost \$2820.83 after 108.3 months

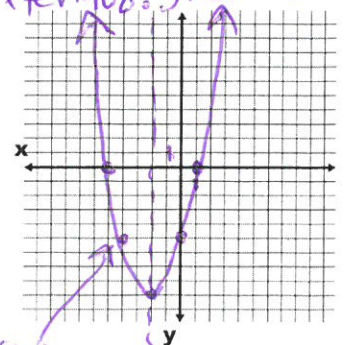
2. Using the following quadratic, find zeros, y-intercept, vertex, one other point, and the Axis of Symmetry then sketch the graph. $y = x^2 + 4x - 5$

$x^2 + 4x - 5 = 0$
 $(x + 5)(x - 1) = 0$
 Zeros - $(1, 0)$ $(-5, 0)$
 Y-intercept - $(0, -5)$
 Vertex - $(-2, -9)$
 A. O. S. - $x = -2$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-4 \pm \sqrt{16 - 4(-5)}}{2} = \frac{-4 \pm \sqrt{36}}{2} = \frac{-4 \pm 6}{2}$
 $x = \frac{-4 + 6}{2} = 1$
 $x = \frac{-4 - 6}{2} = -5$

$y = x^2 + 4x - 5$
 $y = (-2)^2 + 4(-2) - 5 = 4 - 8 - 5 = -9$
 Vertex $(-2, -9)$

$x = -2$ is x of vertex



Make sure to write "x=" because the axis of symmetry is a line!

reflect y-intercept over AOS to get 5th point
 AOS $x = -2$

ANGRY BIRDS



Suppose some very "Angry Birds" are attacking some "pigs" in a castle by using a slingshot to launch themselves at castle walls. Depending on the angle that they are launched at, they will either shoot long and far or high and short. The data about how each slingshot launches each bird is listed below: *Note, how each data is represented in a different way!!*

Slingshot A		Slingshot B	Slingshot C
Distance the bird is from the slingshot (in meters)	Height of the bird (in meters)		$y = -0.015x^2 + 0.975x$ Where x is the distance the bird is from the slingshot and y is the height of the bird.
10	20		$y = -0.015x(x - 65)$ $x - m + (0, 0) \quad x \text{ of vertex} = \frac{0 + 65}{2} = 32.5$ $(65, 0) \quad y \text{ of vertex} = -0.015(32.5)^2 + 0.975(32.5) = 15.844$ $v(32.5, 15.844)$
20	30		
30	30		
40	20		

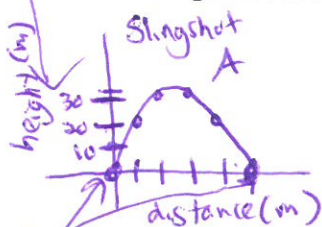
QuadReg
 $y = -0.05x^2 + 2.05x$

- How "far" will each slingshot launch each bird? If the castle is far away, which slingshot should they use and why? If the castle is near, which slingshot should they use and why?

Slingshot A Launch - 50 meters
 Slingshot B Launch - 31 meters
 Slingshot C Launch - 65 meters

Far-away Castle: *If far away castle, use slingshot C because it shoots birds the farthest.*

Near-by Castle: *If nearby castle, use slingshot B because it shoots birds the least distance.*



- Analyze the slingshot data and compare to determine which slingshot shoots the birds the highest. Explain how you know.

Slingshot B shoots birds the highest because its vertex y-value is around 46 meters high. Slingshot C only goes to 15.844 meters and slingshot A goes just a little above 30 meters.

1st & last points filled in for symmetry

3. If the castle walls are 30 feet tall, which slingshot should you use and why?

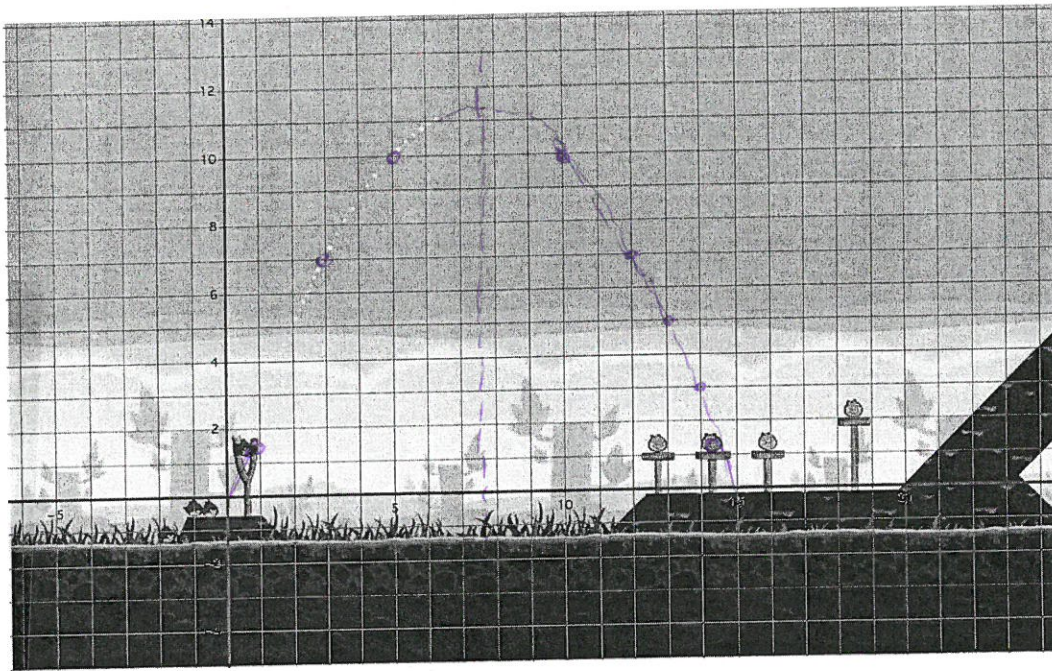
I would use slingshot B because it goes well above 30 meters high - so it will surely go over the wall even if you don't reach the wall at the path at the vertex point.

4. What are the pros and cons of using each Slingshot A, B, or C?

- Slingshot A goes fairly high and far but not as high as others
- Slingshot B goes really high but not as far as others.
- Slingshot C goes fairly far but not high up.

Practice: Can you make the bird hit the pigs?

Take a minute to work in small groups with the people around you. Sketch a graph that you think would make you hit the second pig in this picture.



What do you think the equation to your graph would be?

1st find features of graph

- X-intercepts (0,0) (15,0)
- x of vertex $\frac{0+15}{2} = 7.5$
- axis of symmetry $x = 7.5$
- use axis to get mirror points like (3,7)(12,7)

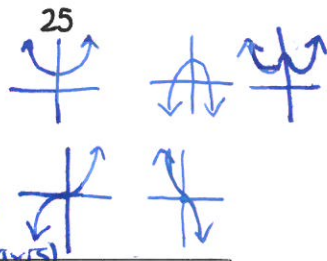
① $y = a(x-0)(x-15)$ use zeros to write factored form
 $y = a(x)(x-15)$ starting equation

② $7 = a(3)(3-15)$ • substitute another point into equation
 $7 = a(3)(-12)$ → I used (3,7)
 $7 = a(-36)$

③ $y = \frac{-7}{36}x(x-15)$ ← substitute a into factored form
 OR $y = \frac{-7}{36}x^2 + \frac{35}{12}x$ standard form

Unit 2 NOTES

Honors Math 2



Functions are • Even \rightarrow Symmetric across y-axis
 • Odd \rightarrow Symmetric about origin
 (reflect over x-axis, then y-axis)

Even VS. ODD Functions

Graph each function on your calculator. Use your graph to fill in the chart.

Graph	Is the Function even or odd?	Is the leading coefficient positive or negative?	Does the function increase or decrease to the left?	Does the function increase or decrease to the right?
1. $y = x^2$	Even	positive	rises left	rises right
2. $y = x^4$	Even	positive	rises left	rises right
3. $y = -x^2$	Even	negative	falls left	falls right
4. $y = -x^4$	Even	negative	falls left	falls right
5. $y = x^3$	odd	positive	falls left	rises right
6. $y = x^5$	Odd	positive	falls left	rises right
7. $y = -x^3$	Odd	negative	rises left	falls right
8. $y = -x^5$	Odd	negative	rises left	falls right

SUMMARY: The end behavior of a polynomial depends on:

- Whether the degree of the polynomial is even number or odd number
- Whether the leading coefficient is positive or negative

* Degree of polynomial is the highest exponent of its terms (when polynomial is in standard form)

End Behavior of a Polynomial Functions				
	Leading coefficient is Positive		Leading coefficient is Negative	
	Left	Right	Left	Right
Function is odd	falls	rises	rises	falls
Function is even	rises	rises	falls	falls

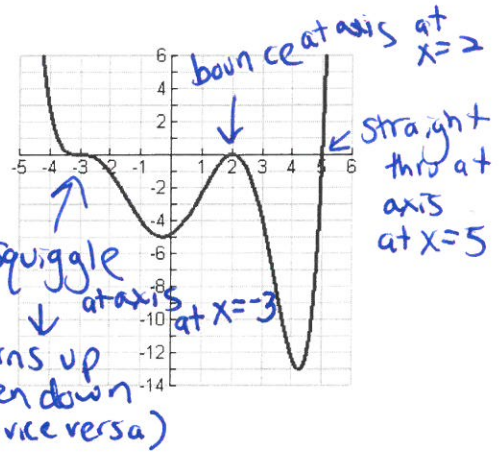
Additional Notes:

Let's determine the equation of a polynomial based on its graph!

Function? $y = a(x+3)^3(x-2)^2(x-5)$

Positive or Negative leading coefficient? positive (rises + rises)
L+ r+

Zeroes? $x = -3$ (squiggle), $x = 2$ (double root), $x = 5$ (straight thru)



Equation: $y = (x+3)^3(x-2)^2(x-5)$

y-int (0,5) $y = a(x+3)^3(x-2)^2(x-5)$
 $-5 = a(0+3)^3(0-2)^2(0-5)$
 $-5 = a(-540)$ $a = 1/108$

finding a-value is not important here in Math 2... you'll probably do this more in math 3

SUMMARY: The multiplicity of a zero determines the behavior of the graph at the zero.

- A multiplicity that is an ODD number will result in the graph crossing the x-axis. (OC)
- A multiplicity that is an EVEN number will result in the graph touching the x-axis (ET).
- If the graph squiggles at the zero, the multiplicity is 3.

ET touches
OC crosses

- If graph bounces at the zero, the multiplicity is 2.
- If graph goes ^{straight} through at the zero, the multiplicity is 1.