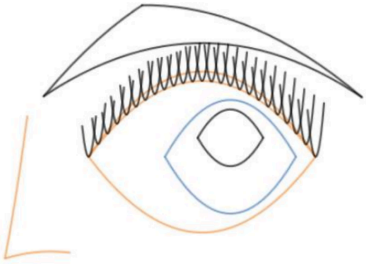
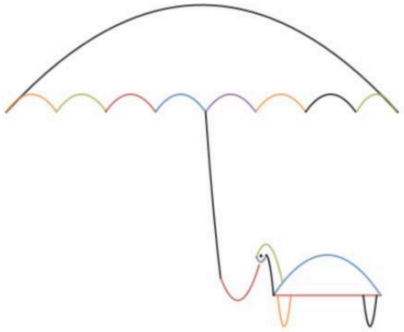
Parabola Art Task



- Your task is to create your own artwork using only parabolas.
- Use your knowledge of transformations to create all the equations you need.

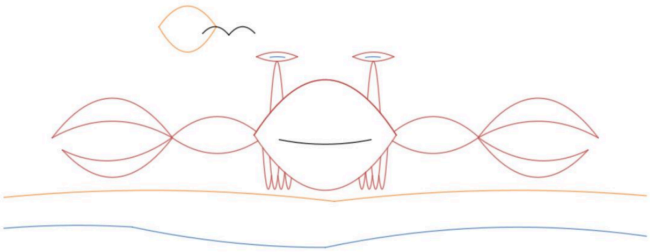
This task is due <u>before</u> you leave for November Break.

Requirements



- ☐ Use between 10 and 30 parabolas in your artwork.
- ☐ Use at least 1 equation written in standard form, 1 equation in vertex form, and 1 equation in intercepts form.
- ☐ Demonstrate you can determine the equation of a parabola without using technology by finding two equations by hand, on paper.

Step 1: Make a plan



- Create a sketch on graph paper and show it to your teacher.
- Your teacher will draw the x and y-axes for you.

Step 2: Complete Fish Tutorial

- Watch or read the tutorials on how to draw a fish in Desmos. Learn about how to use sliders and how to create domain and range restrictions. Show your completed fish to your teacher.

Step 3: Create your work in Desmos

- Use the link provided on our class website / Edsby.
- Remember to determine the equation of two parabolas, on paper.

Fish Tutorial

The LCS Math Team has used some version of this task for many, many years. A few years ago, Mr. McRae made some really nice tutorials explaining how to use Desmos to "draw" using the graphs of quadratic relations.

Video Tutorial

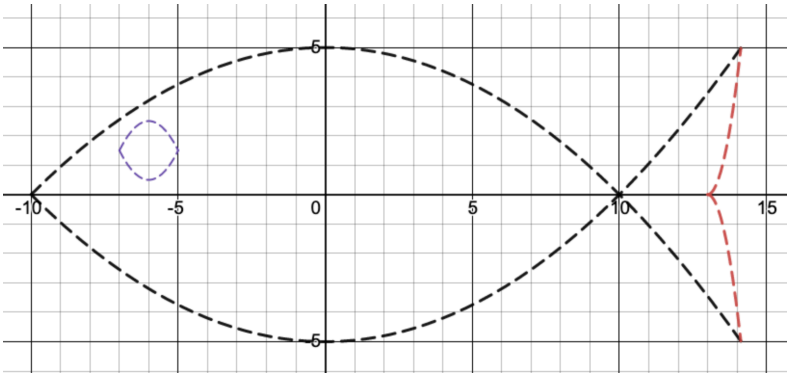
If you prefer, you can complete this tutorial by watching the following videos:

Part 1 Using Sliders, Creating Parabolas
Part 1a Creating the Fish Eye and Tail
Part 2 Cleaning up Desmos Art with Domain Restrictions

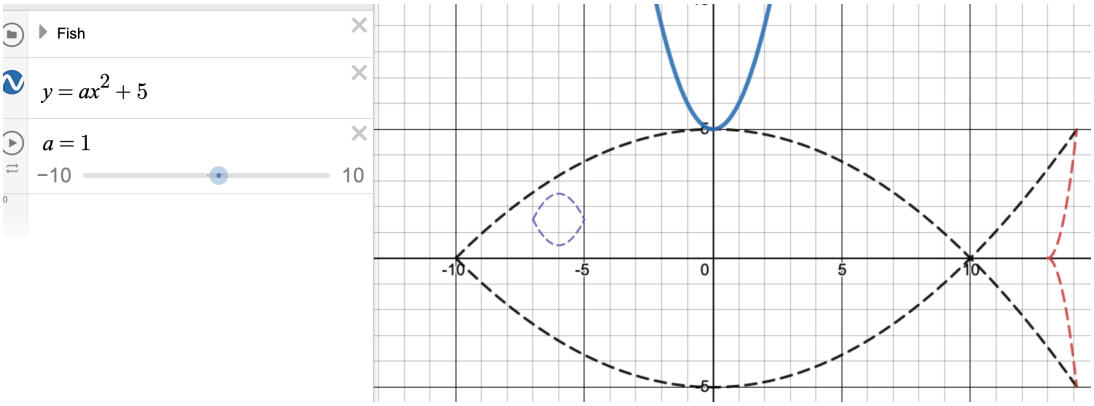
Alternatively, you can read through the same tutorial below.

Written Tutorial

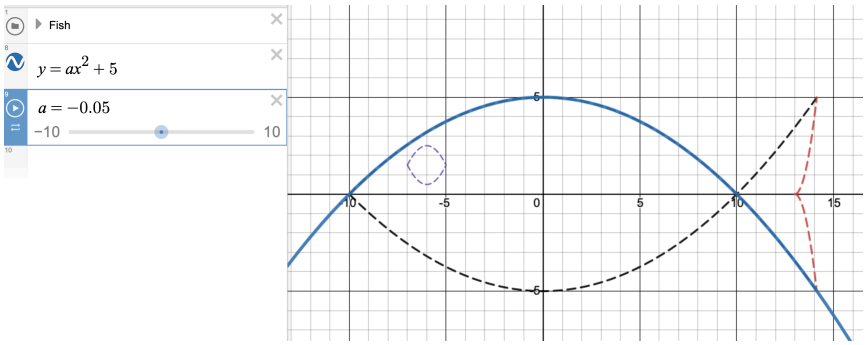
Hello, I'm Mr. McRae. Here is the fish I would like to draw:



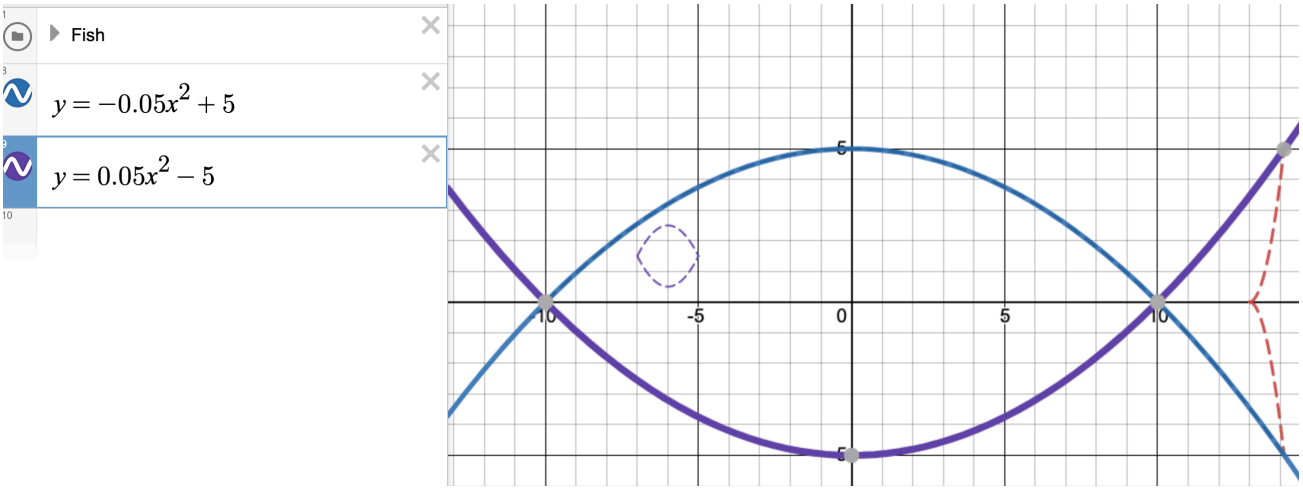
I'm going to start with the black dashed curves. I notice the vertex of the upper curve is at $(0, 5)$. I'll create this equation $y = ax^2 + 5$. Then I'll click on: add slider: a



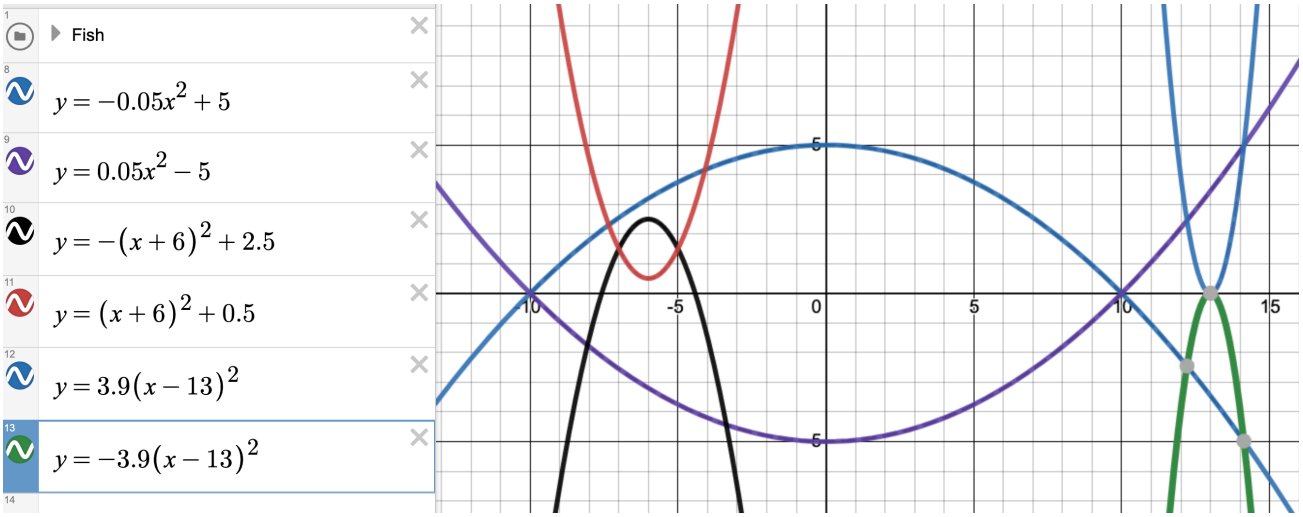
Now I'll adjust a until it matches my sketch…



Now I'll copy this relation to create the bottom half of the fish. I'll need to adjust a couple of values…

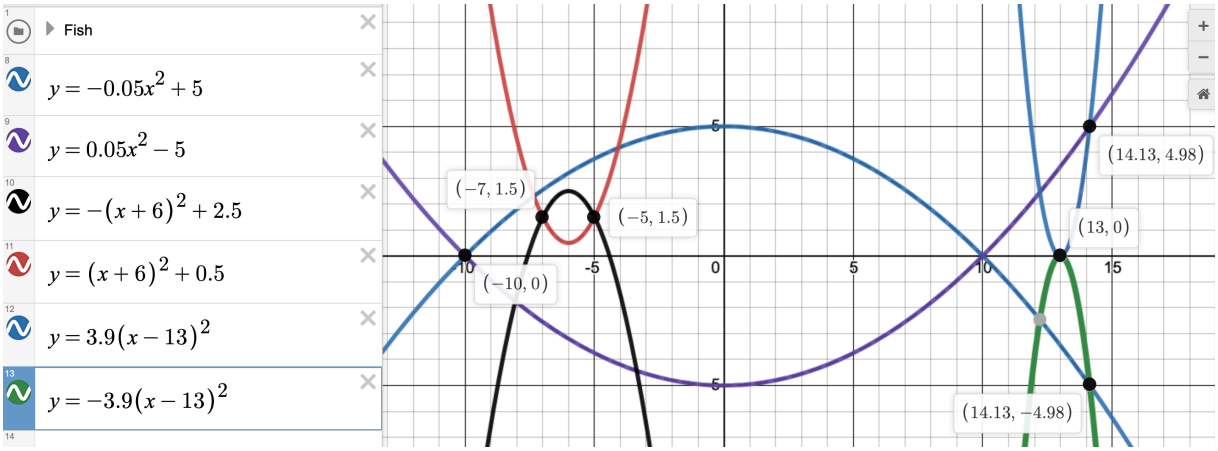


Now I'll repeat the same process for the eye and remaining tail relations…



Finally, I'll add a domain restrictions to clean up the fish. *Domain* is a word we use to describe the possible inputs for a relation. Normally, every number from negative infinity to positive infinity is a possible input to $y = x^2$, but here we want to restrict the domain to specific values so that we can make our picture look more like an actual fish.

You'll see below that I'm going to use Desmos to help find the best values for domain restrictions. You can click the intersection point of graphs to see the co-ordinates…



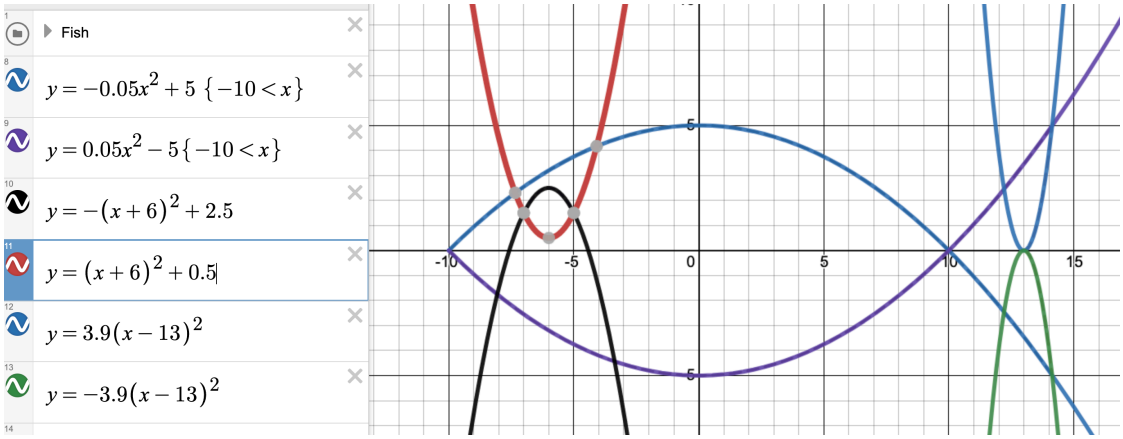
Let's start with the blue and purple lines. On the left hand side I see that the fish starts with an x-value of -10.

I'll add the following restrictions – notice how I use the curly brackets, like this: { }

$y = -0.05x^2 + 5\ \{-10 < x\}$

$y = 0.05x^2 - 5\{-10 < x\}$

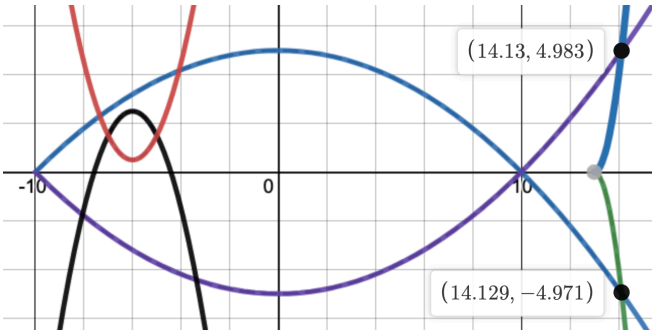
Notice that the blue and purple lines are now "cut off" on the left side – the graph only exists for inputs greater than -10:



Now let's clean up the tail. I'll start with the following restrictions:

$y = 3.9(x-13)^2 \ \{13 < x\}$

$y = -3.9(x-13)^2 \{13 < x\}|$



The next restrictions will be – notice how I added < 14.129 in each:

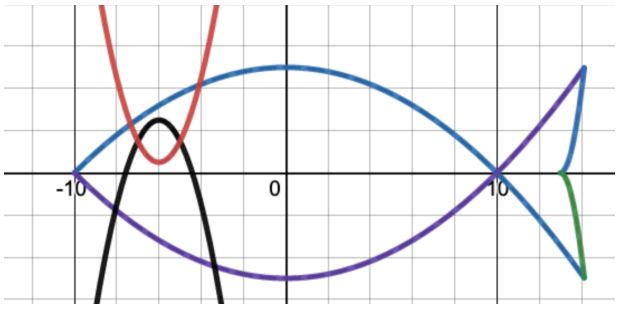
$y = 3.9(x-13)^2 \ \{13 < x < 14.129\}$

$y = -3.9(x-13)^2 \{13 < x < 14.129\}$

$y = -0.05x^2 + 5 \ \{-10 < x < 14.129\}$

$y = 0.05x^2 - 5 \{-10 < x < 14.129\}$

Here is the result:



I'll finish with these restrictions for the fish eye:

$y = -(x+6)^2 + 2.5 \ \{-7 < x < -5\}$

$y = (x+6)^2 + 0.5 \{-7 < x < -5\}|$