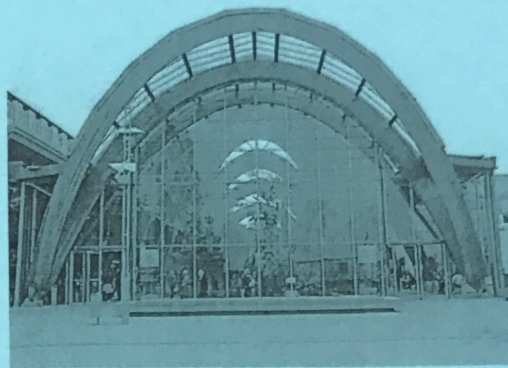


## 8.5 Functioning With Parabolas

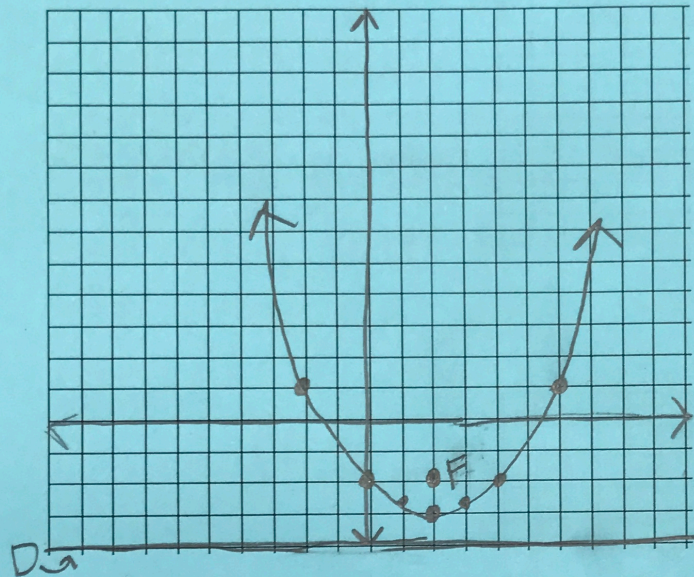
### A Solidify Understanding Task

Sketch the graph (accurately), find the vertex and use the geometric definition of a parabola to find the equation of these parabolas.



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1. Directrix  $y = -4$ , Focus  $A(2, -2)$



Vertex  $(2, -3)$

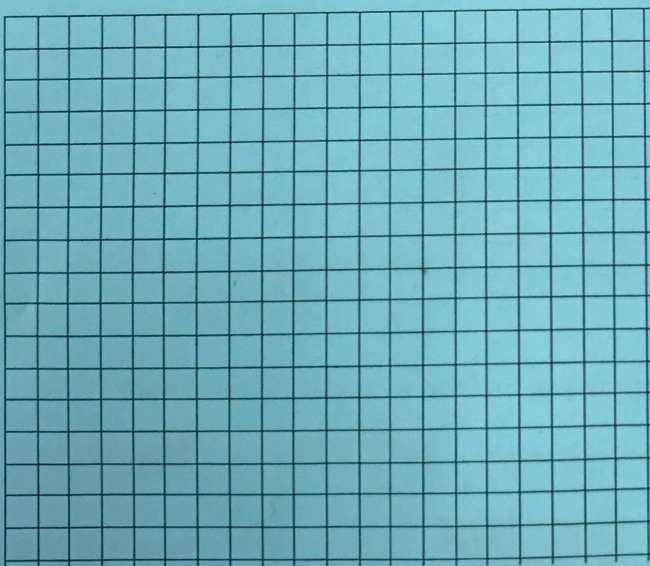
$$(x-2)^2 = 4(1)(y+3)$$

$$\frac{(x-2)^2}{4} = \frac{4(y+3)}{4}$$

$$\frac{1}{4}(x-2)^2 = y+3$$

Equation:  $y = \frac{1}{4}(x-2)^2 - 3$

2. Directrix  $y = 2$ , Focus  $A(-1, 0)$



Vertex  $(-1, 1)$

Equation:  $y = -\frac{1}{4}(x+1)^2 + 1$

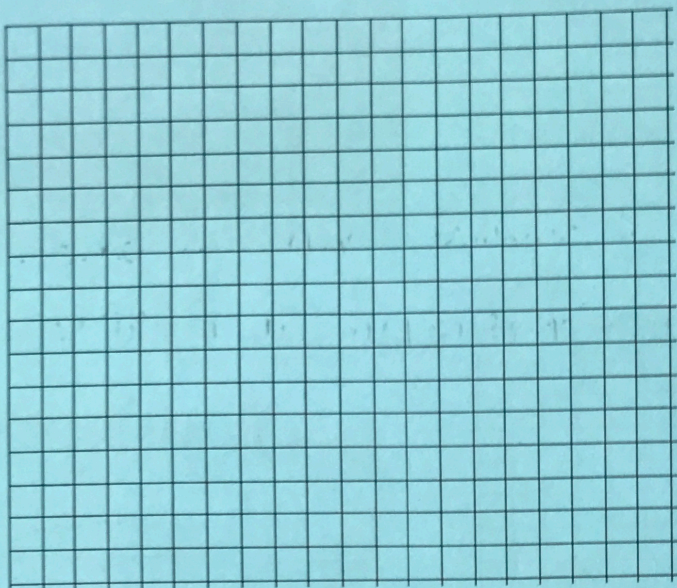
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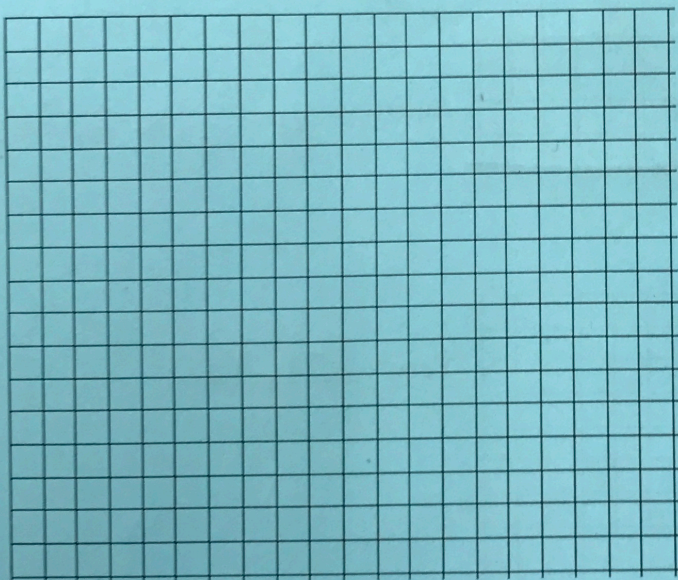
3. Directrix  $y = 3$ , Focus  $A(1, 7)$



Vertex  $(1, 5)$

Equation:  $y = \frac{1}{8}(x-1)^2 + 5$

4. Directrix  $y = 3$ , Focus  $A(2, -1)$



Vertex  $(2, 1)$

Equation:  $y = -\frac{1}{8}(x-2)^2 + 1$

5. Given the focus and directrix, how can you find the vertex of the parabola?

Below the focus point, halfway between  
focus point and directrix

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6. Given the focus and directrix, how can you tell if the parabola opens up or down?

If the focus is above the directrix then it opens up.

If the focus is below the directrix then it opens down.

7. How do you see the distance between the focus and the vertex (or the vertex and the directrix) showing up in the equations that you have written?

the "p" value, it combines with 4 and becomes part of the dilation value ("a" value) out in front.

8. Describe a pattern for writing the equation of a parabola given the focus and directrix.

1. Find vertex and determine p

2. Plug parts into the equation

3. Solve for y.

9. Annika wonders why we are suddenly thinking about parabolas in a completely different way than when we did quadratic functions. She wonders how these different ways of thinking match up. For instance, when we talked about quadratic functions earlier we started with  $y = x^2$ . "Hmmm. .... I wonder where the focus and directrix would be on this function," she thought. Help Annika find the focus and directrix for  $y = x^2$ .

$p = \frac{1}{4}$

focus:  $(0, \frac{1}{4})$

directrix:  $y = -\frac{1}{4}$

