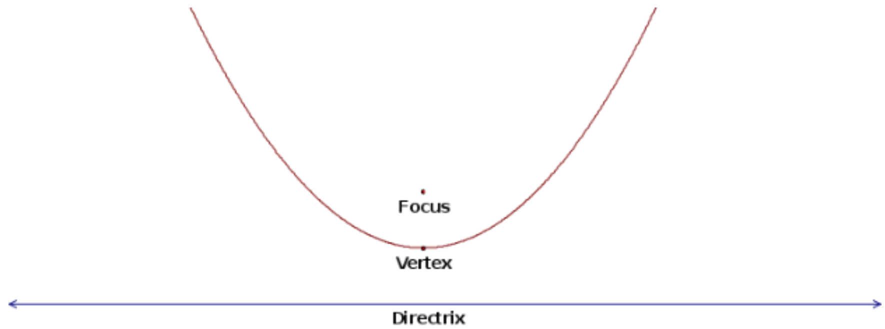
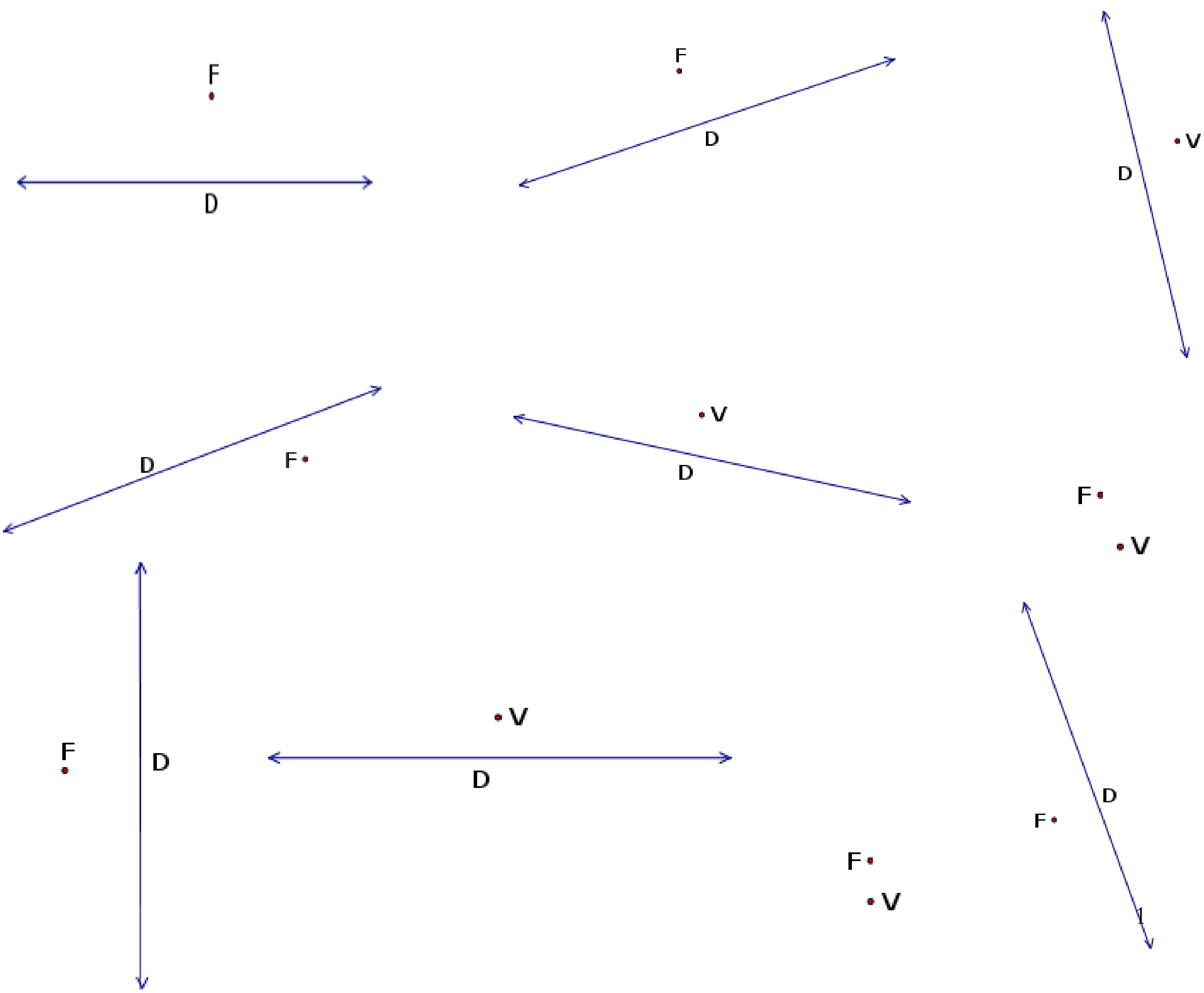
Name: ____________________ Date: ______________ Period: ______

Parabolas Day One Activity Sheet and Homework

The diagram below depicts a parabola with its directrix, focus, and vertex.

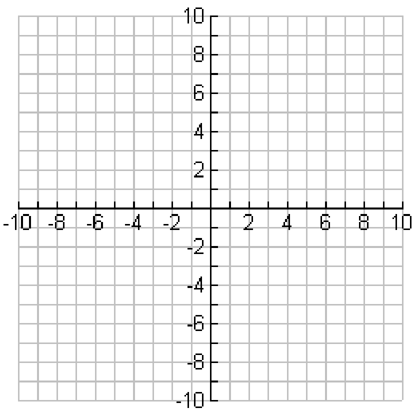


1. For each of the parabolas below, two of the three parts is given (F = focus, D = directrix, and V = vertex). Sketch the location of the missing part, and then sketch the parabola.



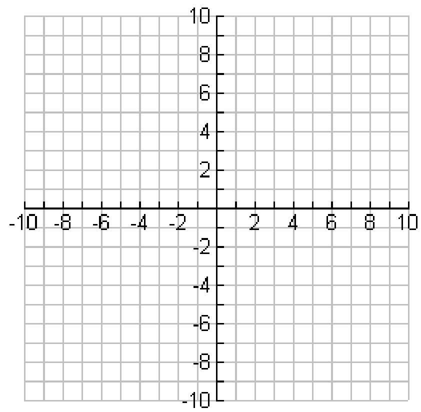
2. For each graph, the location of two of the three parts is given. Graph all three parts and the parabola, and then give the missing piece of information.

a) Directrix: y = -3
Vertex: (5, 1)



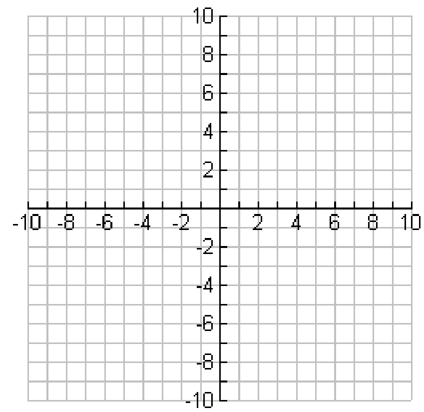
Focus: ___________

b) Focus: (-6, 4)
Vertex: (-6, -1)



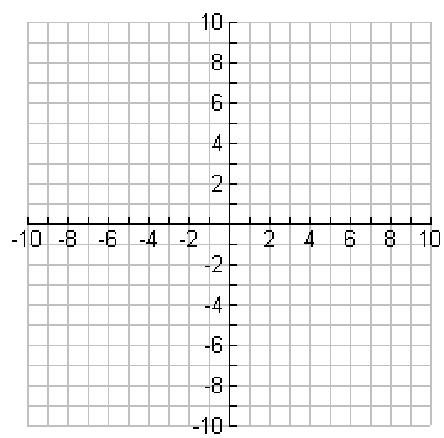
Directrix: ___________

c) Directrix: x = 5
Focus: (-7, -2)



Vertex: ___________

3. A certain parabola has a directrix at y = -9, and a focus at (0, -7).



a) What are the coordinates of the vertex?

b) Graph and label the directrix, focus, and vertex on the right.
Don't graph the parabola yet!

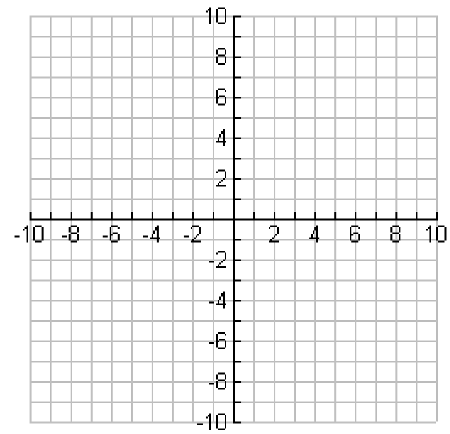
c) Graph the point (5, 4). How far is (5, 4) from the directrix?

d) How far is (5, 4) from the focus? (hint: use the distance formula!)

f) Is the point (5, 4) on the parabola? How do you know?

4. A certain parabola has a directrix at $y = -1$, and a focus at $(0, 1)$.

a) What are the coordinates of the vertex?



b) Graph the directrix, focus, and vertex on the graph on the right. Also, sketch the parabola.

c) Consider a random point (x, y). Draw the point on the right side of the parabola. How far is (x, y) from the directrix? Your answer here will be an expression using y.

d) Use the distance formula for the points $(0, 1)$ and (x, y) to figure out how far the point (x, y) is from the focus. Your answer here will be an expression with x and y.

e) Because we know that every point on the parabola is the same distance from the directrix as it is from the focus, we can take the expressions from part (c) and part (d) and set them equal to each other. Since we used variables to make this equation, the equation represents any point on the parabola.

f) Take the equation you wrote in part (e) and solve it for y. You've just derived the formula for this parabola!

5. Derive the formula for a parabola with a focus at $(6, 2)$, and a directrix at $y = -8$.

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Parabolas Day Two Station Questions

(see pages 6-21 for each of the parabolas)

Station One

Here we move the directrix down one and the focus up one in each picture.

What do you notice about the vertex?

What happens to the graph as the directrix and focus are separated?

Try to find a connection between the quadratic equation given and the separation of these two. What do you find?

Station Two

Here we move the directrix and the focus up and down together.

What do you notice about the vertex?

What happens to the graph as the directrix and focus move up? What happens when these two move down?

Try to find a connection between the quadratic equation given and the up/down movement of these two.

Station Three

Here we move the focus right and left together.

What do you notice about the vertex?

What happens to the graph as the focus moves left? What happens when the focus moves right?

Try to find a connection between the quadratic equation given and the right/left movement of the focus.

Station 4

Here we see two different cases where we have the focus above and below the directrix.

What do you notice about the vertex?

What happens to the graph when the focus is above?

What happens when it is below?

Try to find a connection between the quadratic equation given and the change in position of the focus.

Parabolas Gallery Walk

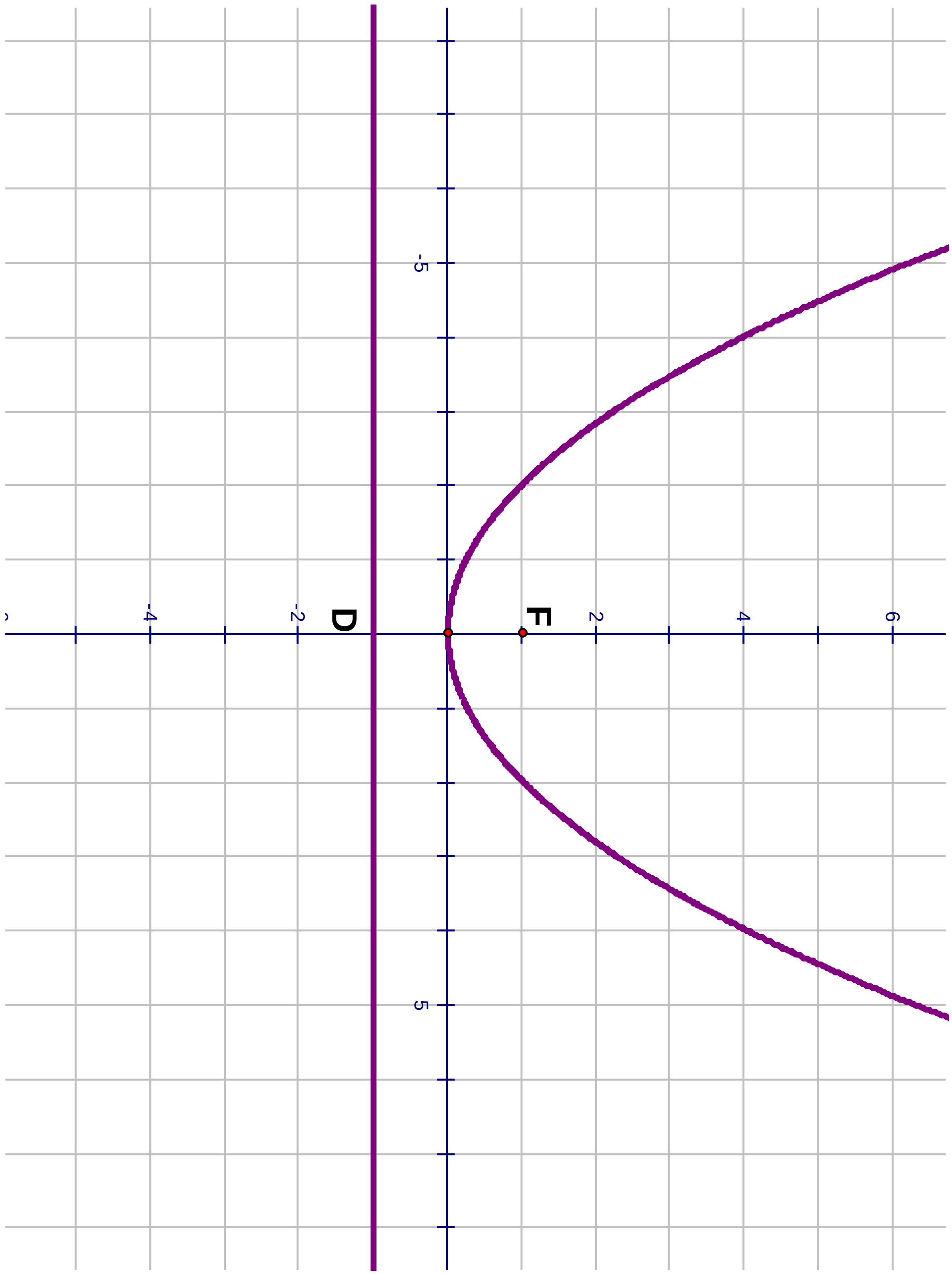
All parabolic graphs below should be printed off with their focus, vertex, directrix, and parabolic equation included (unless you want the students to derive the equations first themselves and put them in vertex form, a great option for gifted students).

Station One (pages 7 to 9): The focus/directrix are moved away from each other, widening the parabola and increasing the denominator of the fraction that is the leading coefficient for the equation.

Station Two (pages 10 to 13): The focus/vertex/directrix are shifted vertically, increasing and decreasing the value of k of the equation when in vertex form.

Station Three (pages 14 to 17): The focus/vertex are shifted horizontally, increasing and decreasing the value of h of the equation when in vertex form.

Station Four (pages 18 to 21): The focus/directrix change positions, causing the parabola to flip upside down and changing the sign of the leading coefficient.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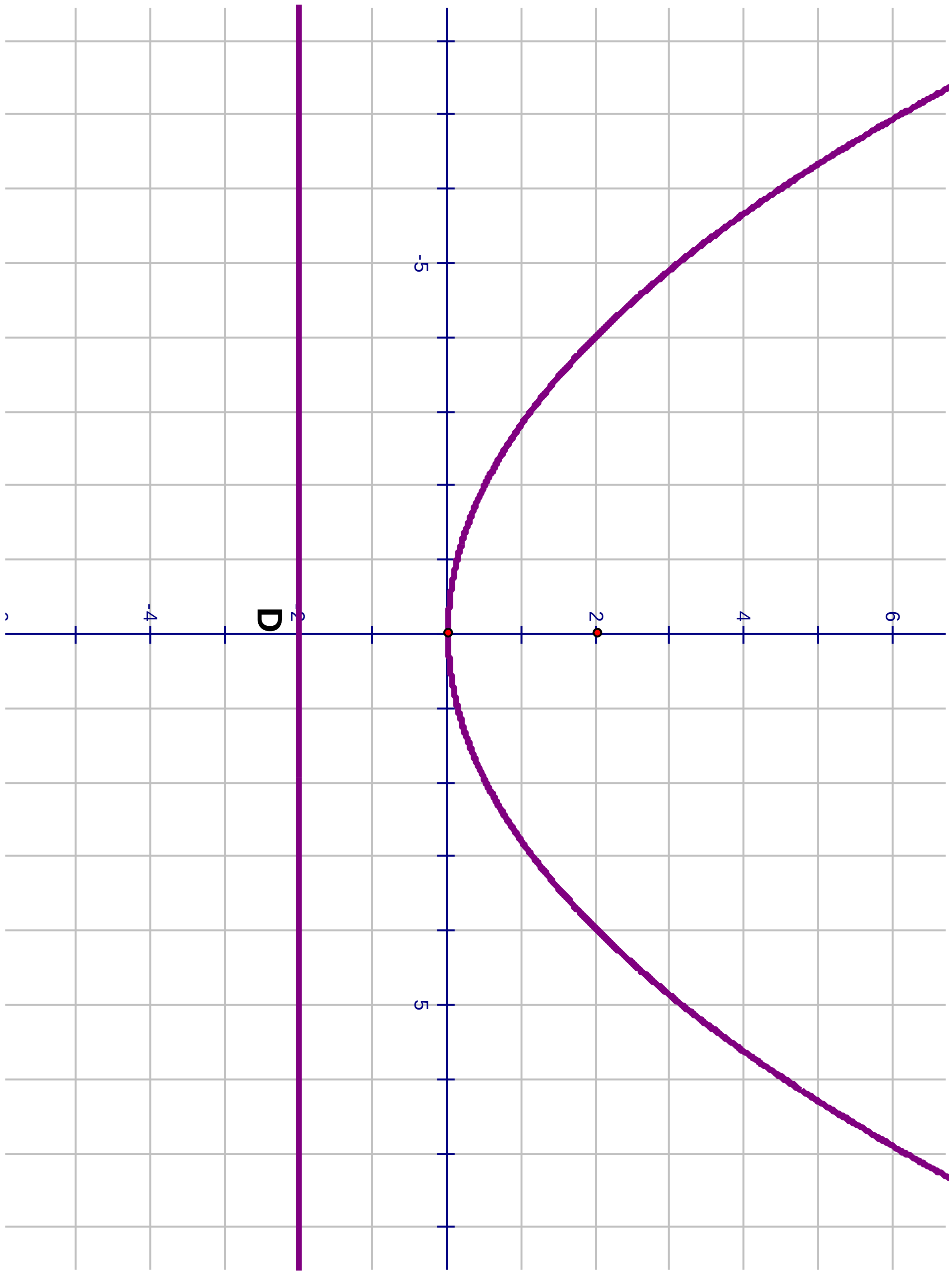
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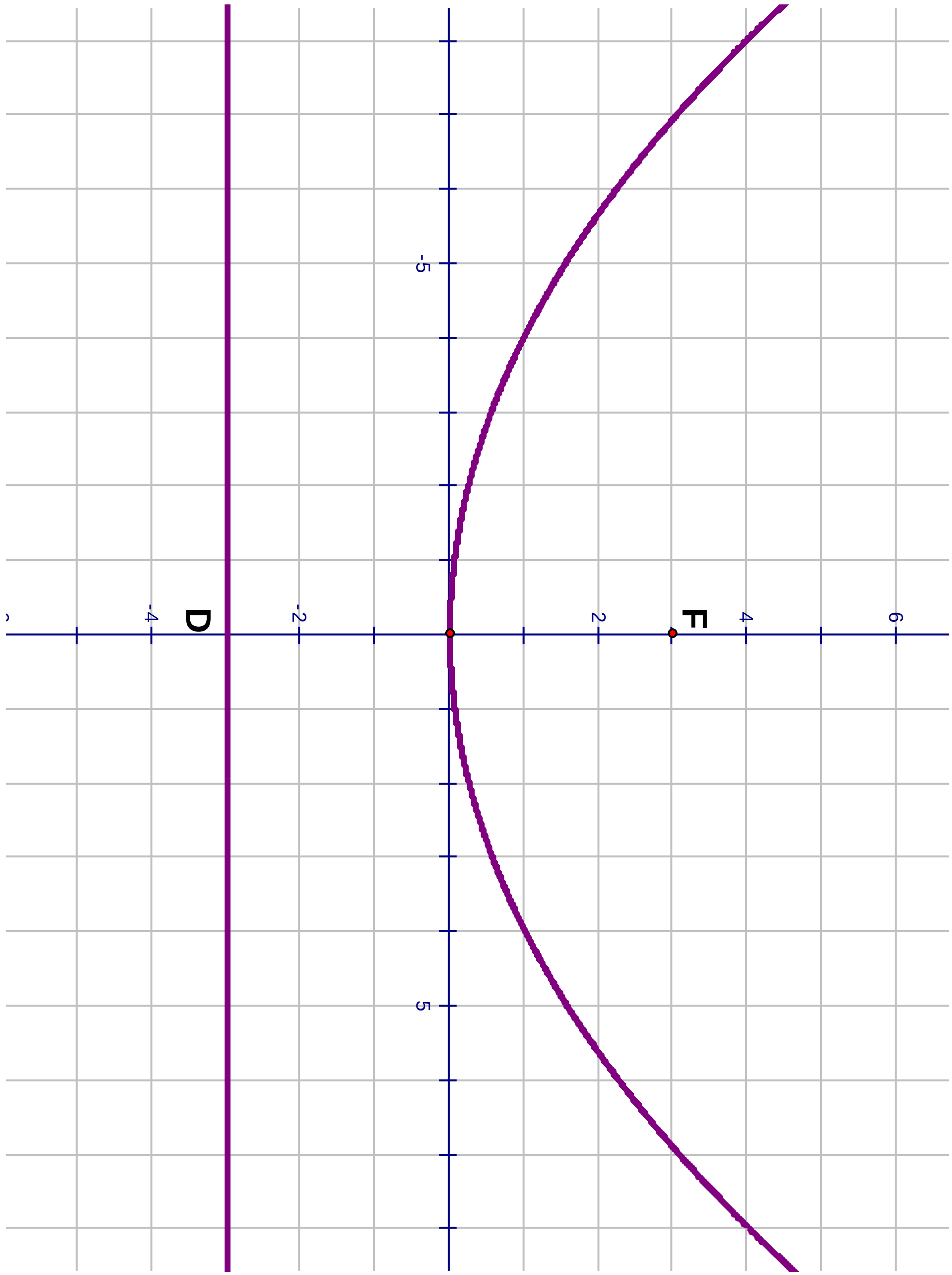

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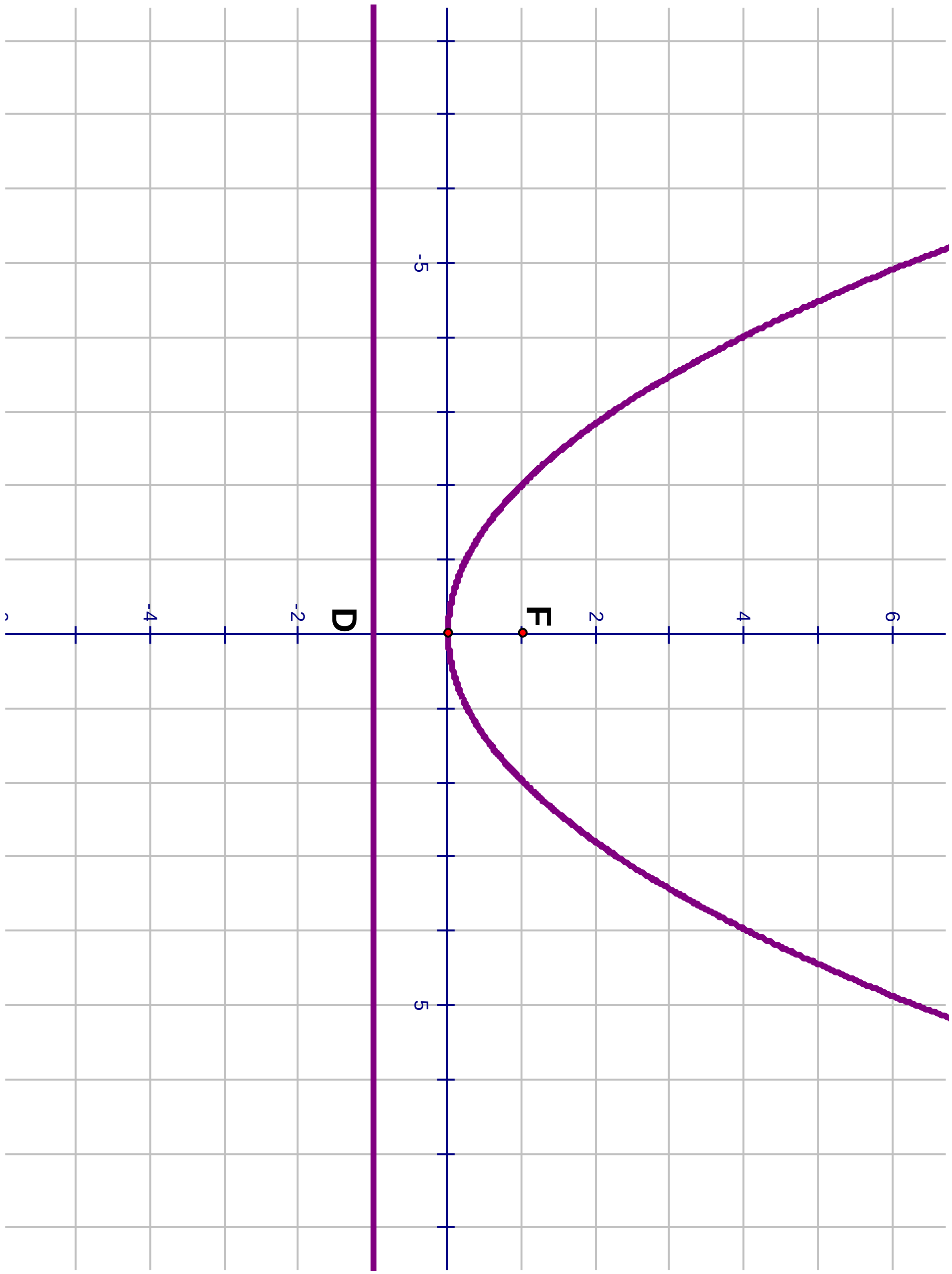
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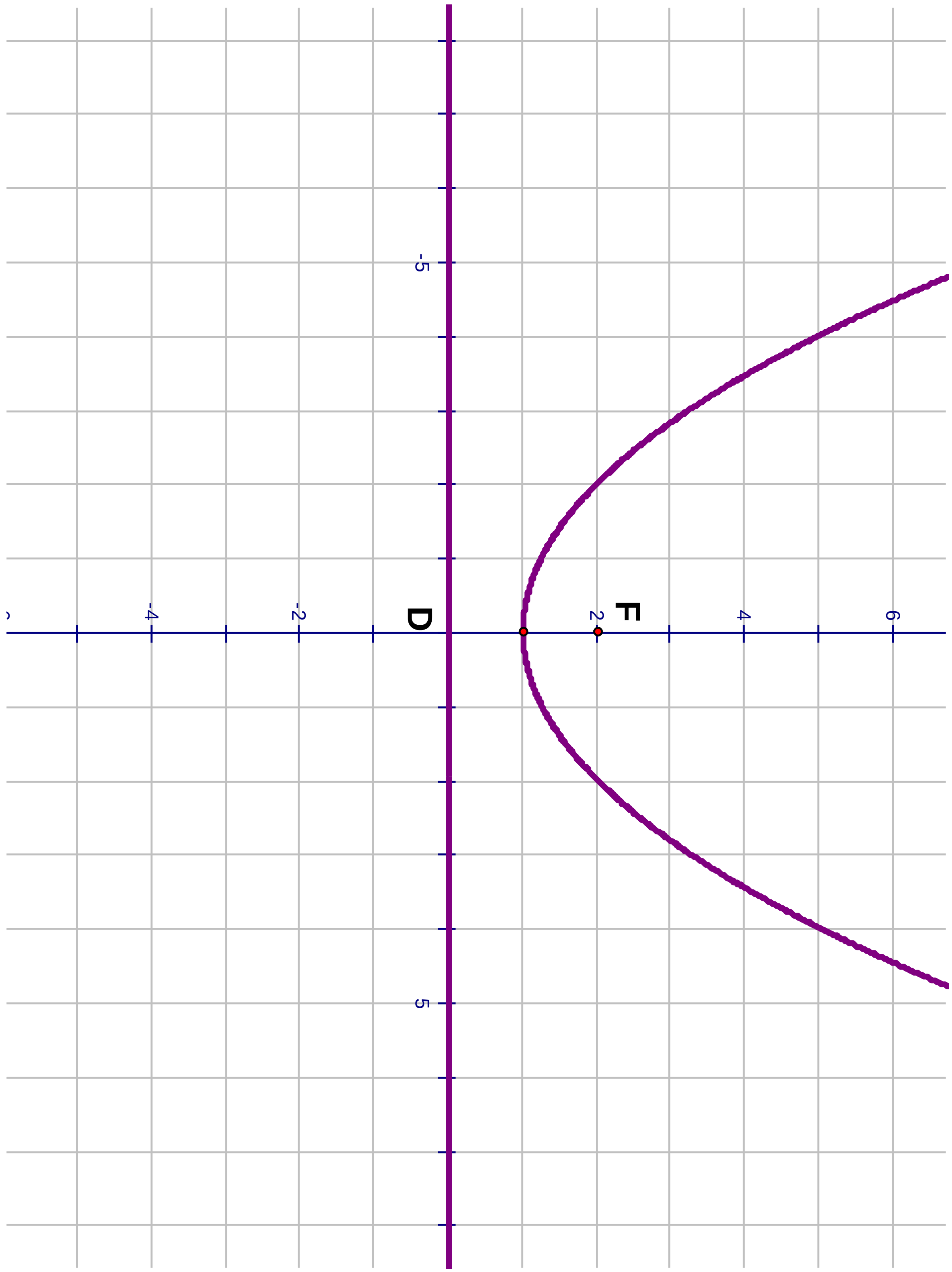
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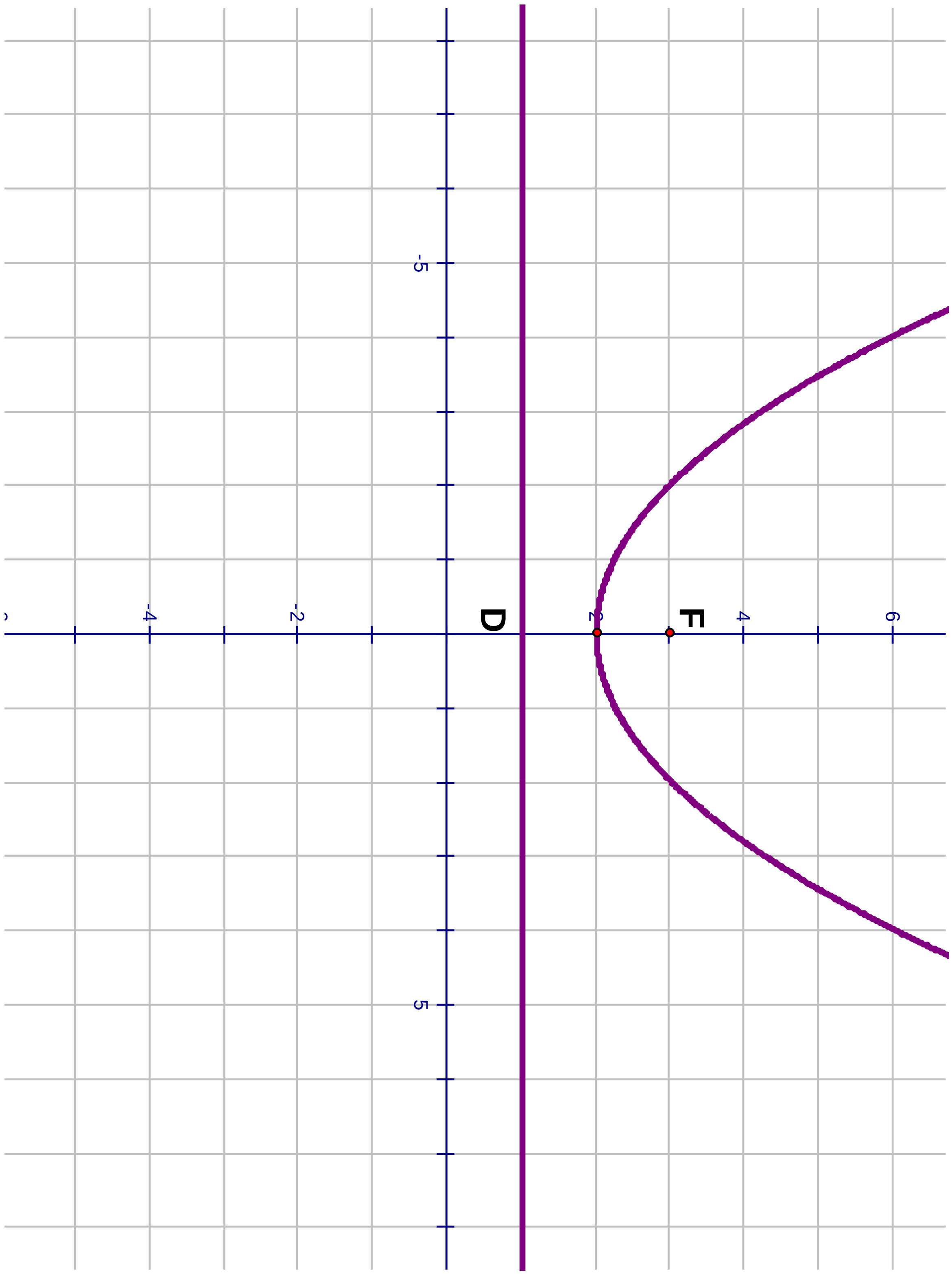

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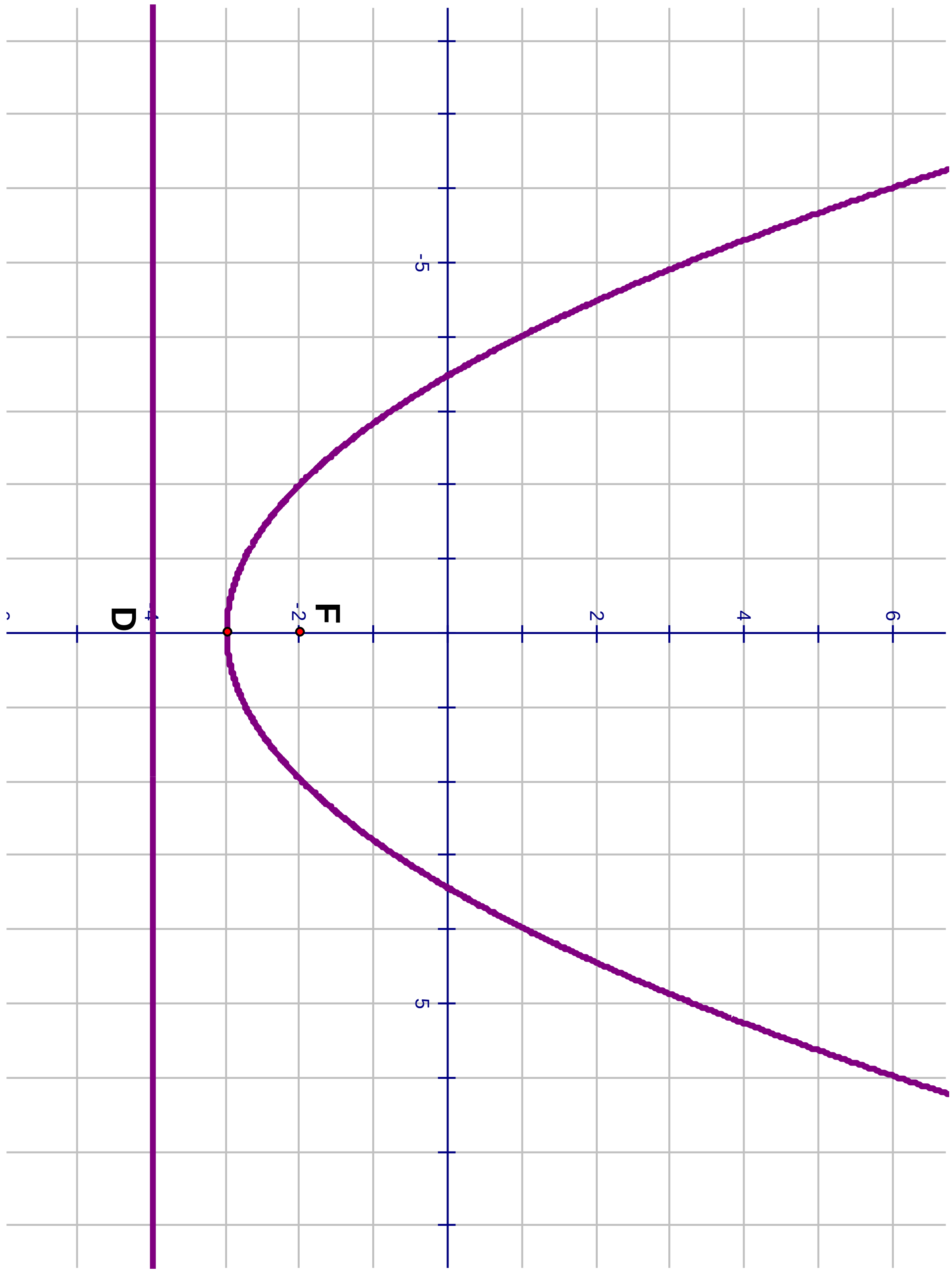

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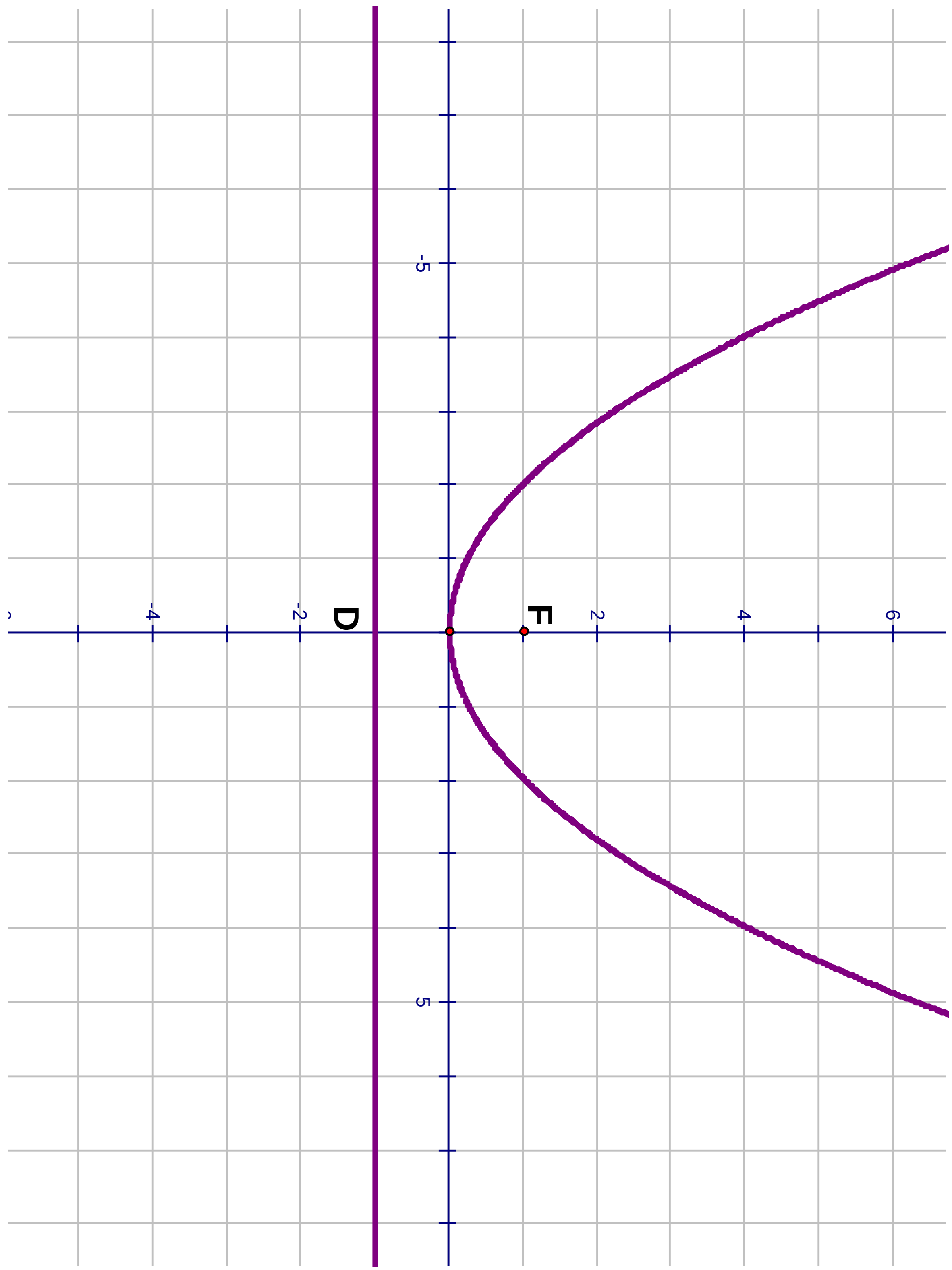
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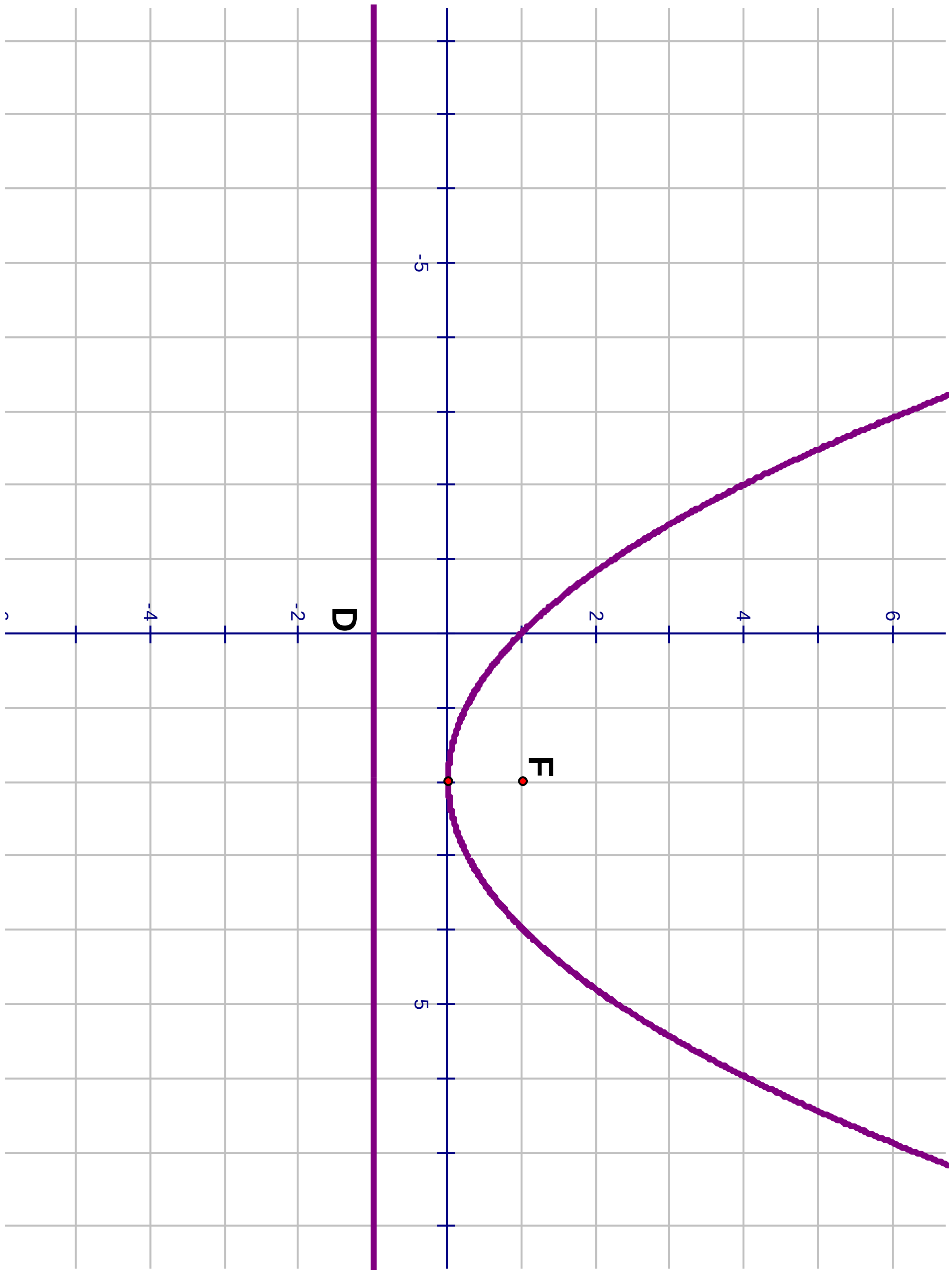
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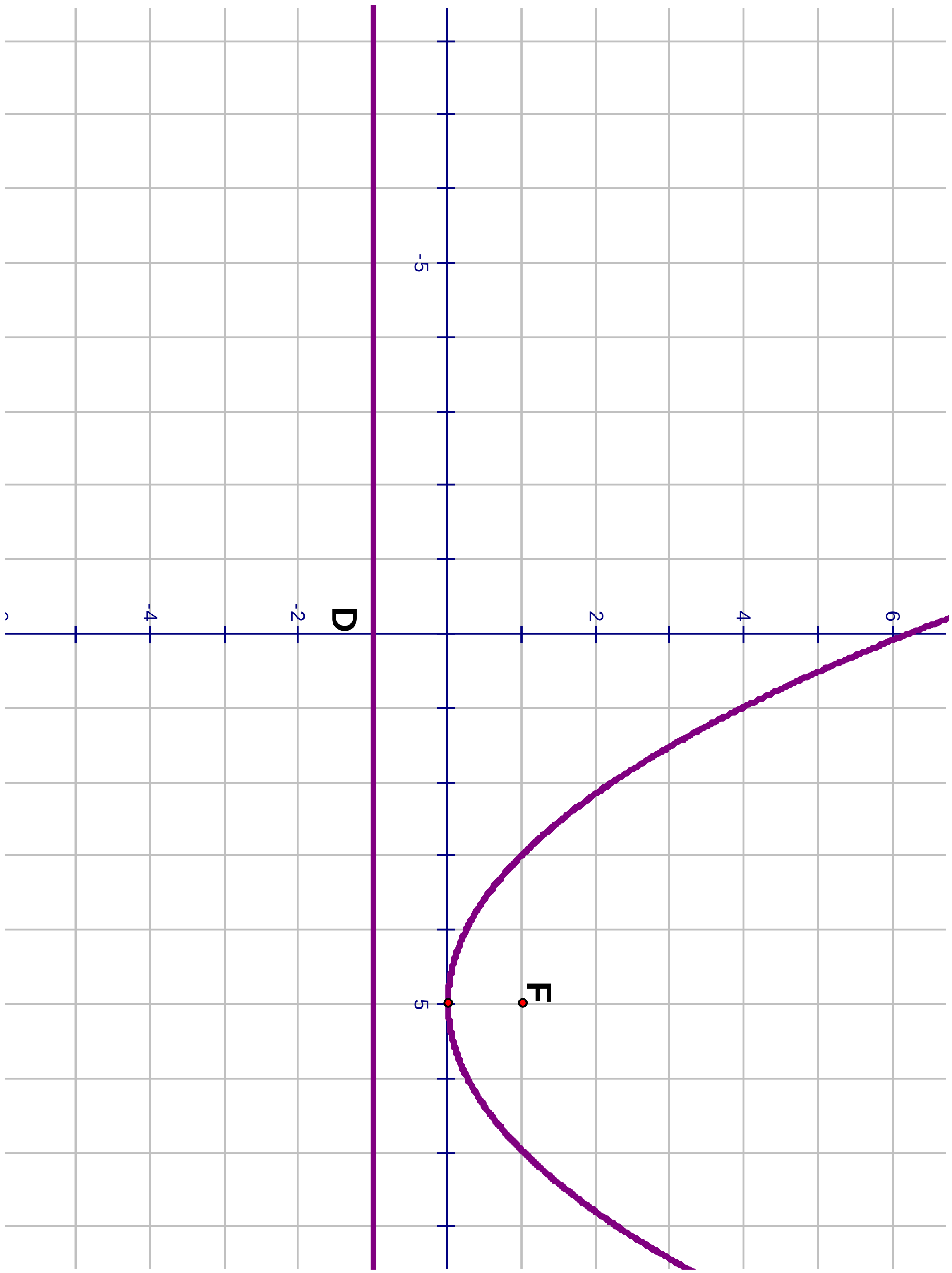
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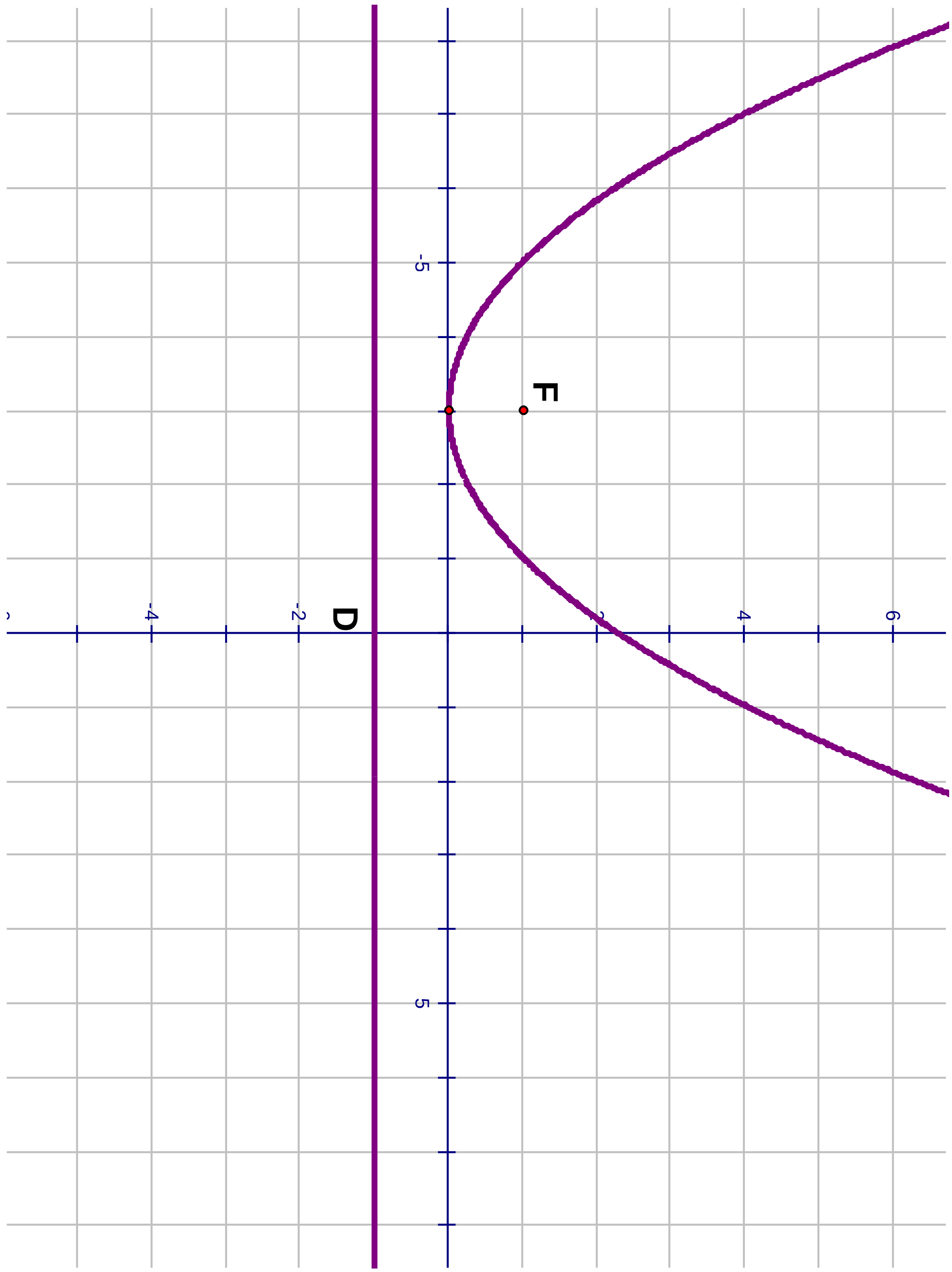
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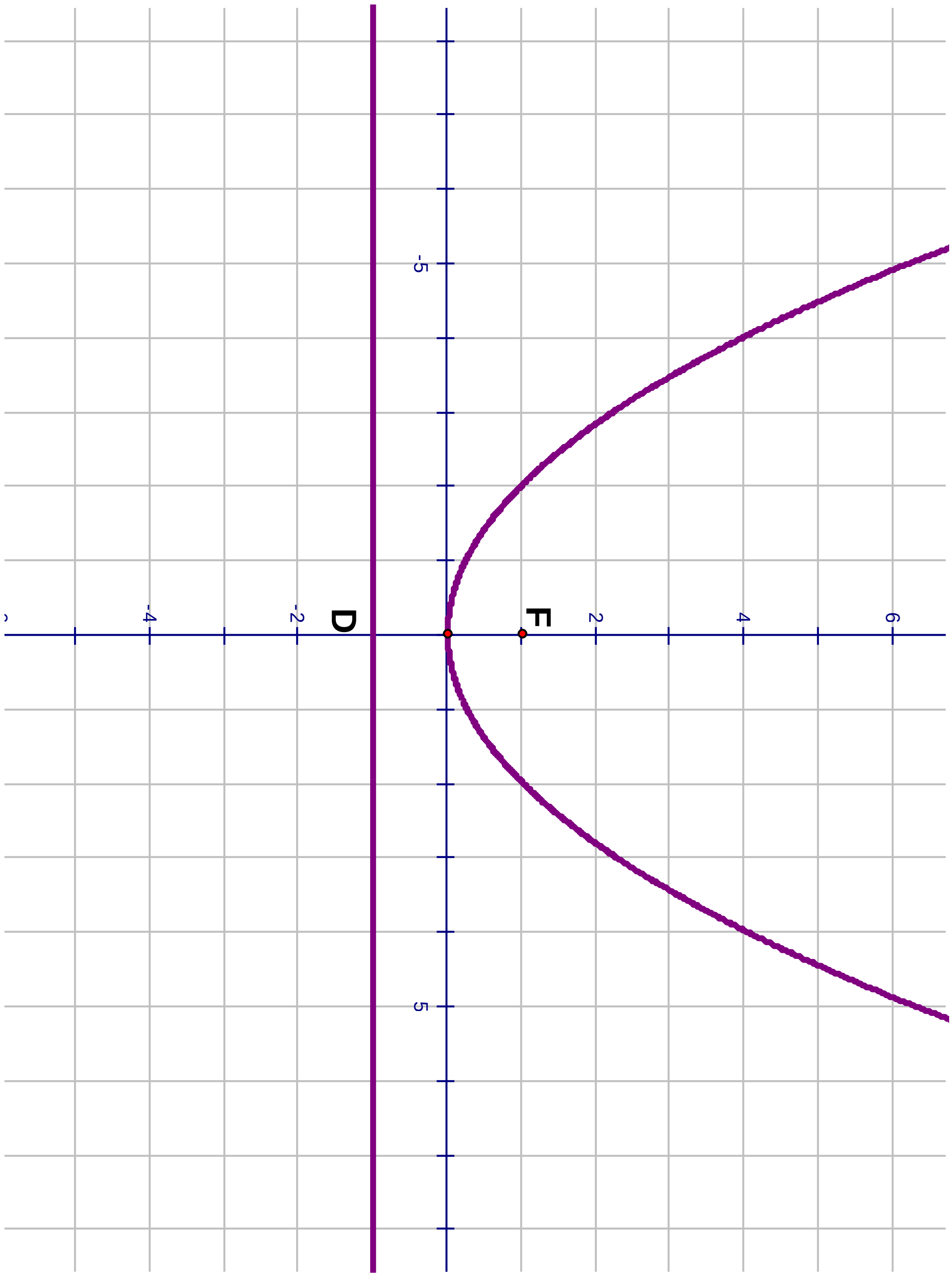
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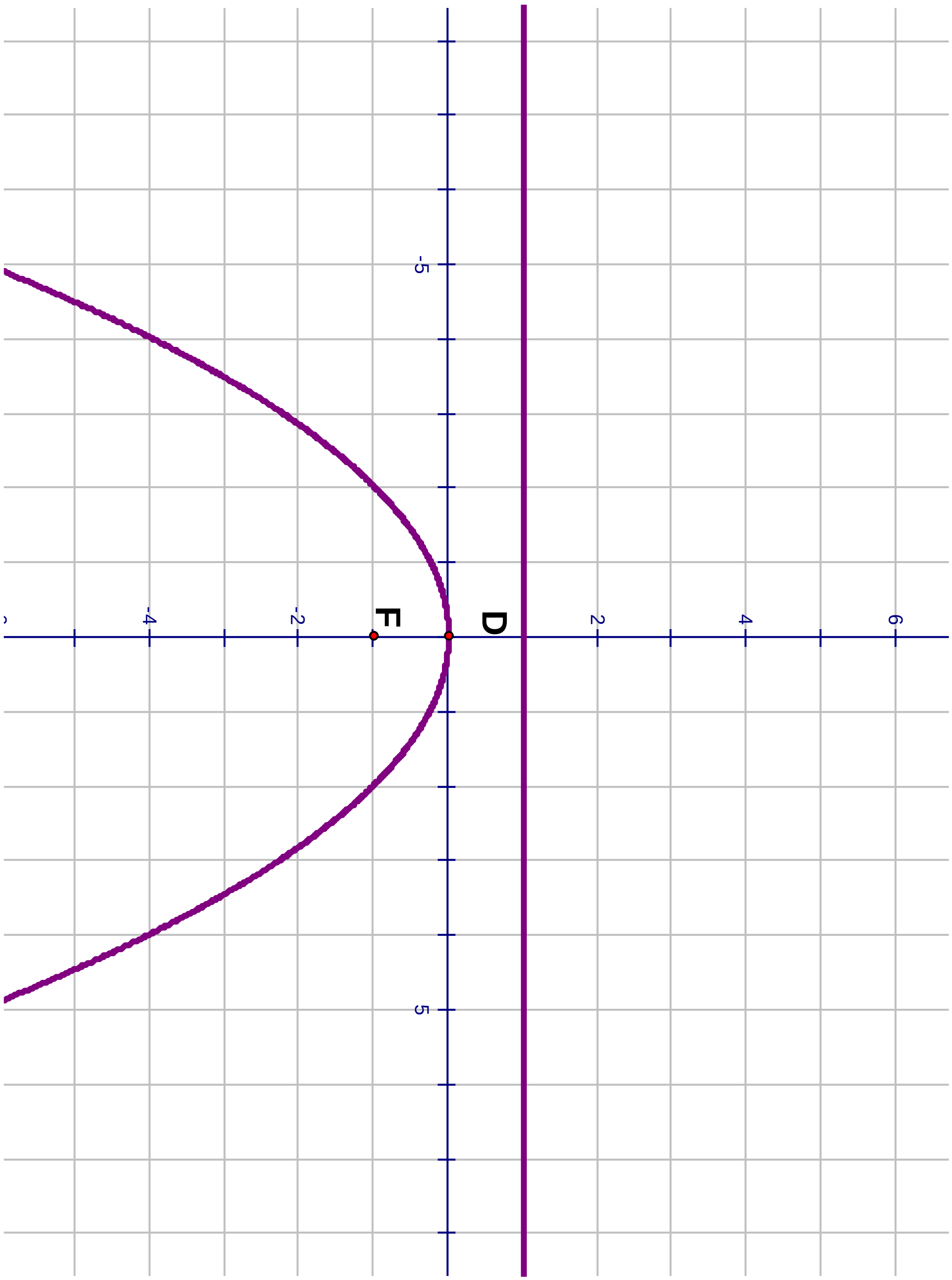
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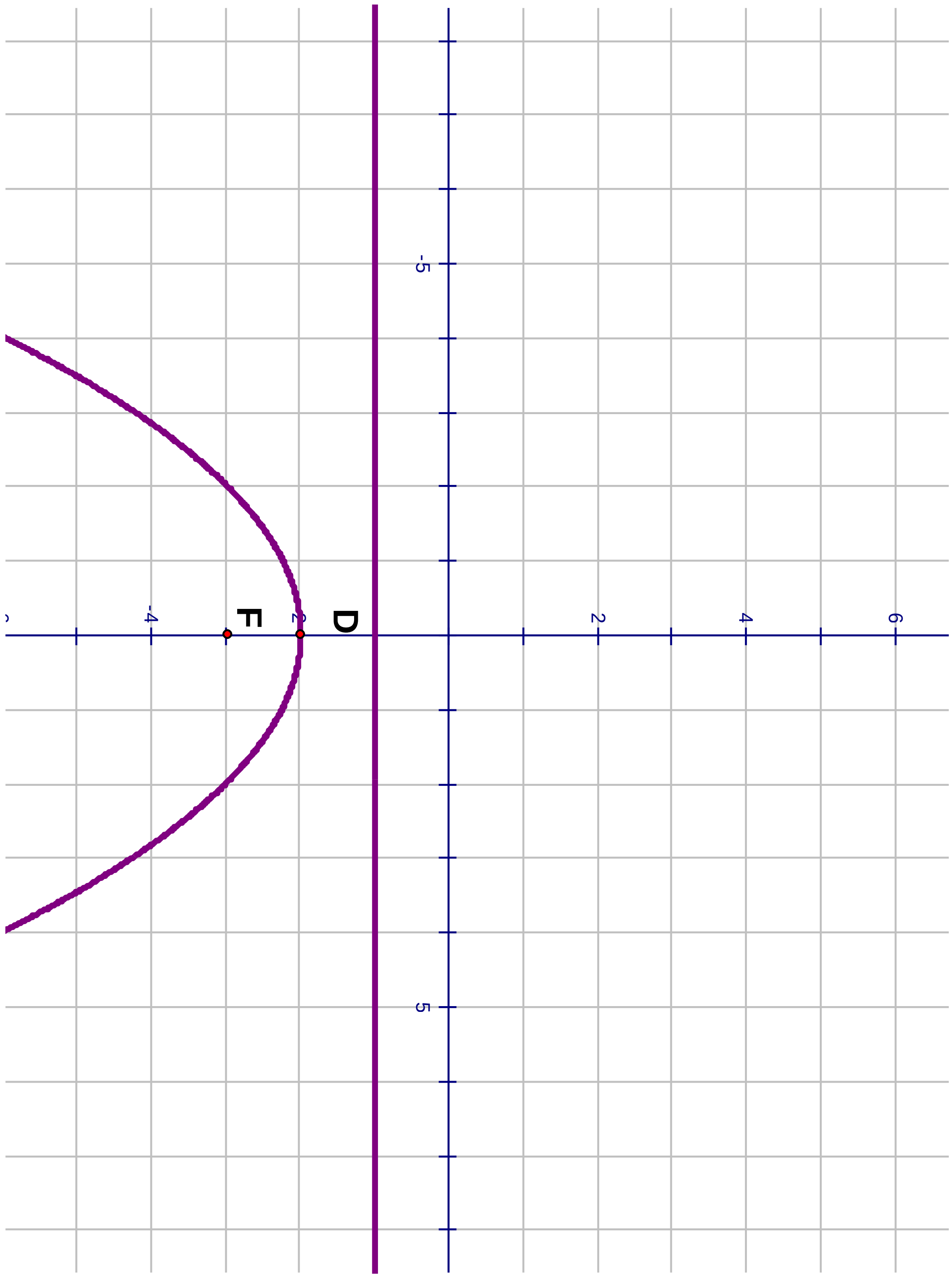
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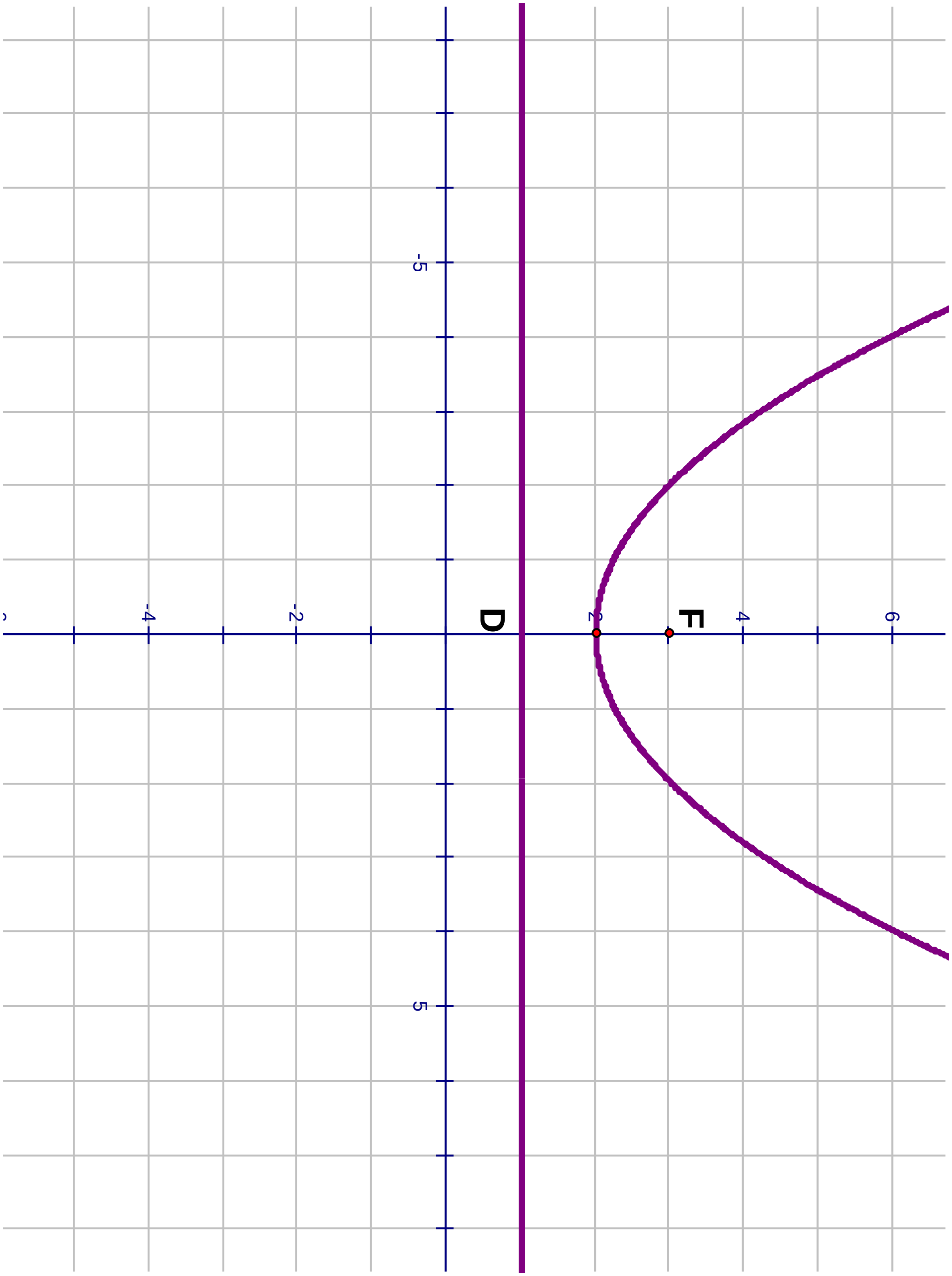
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