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16. Sketching level curves

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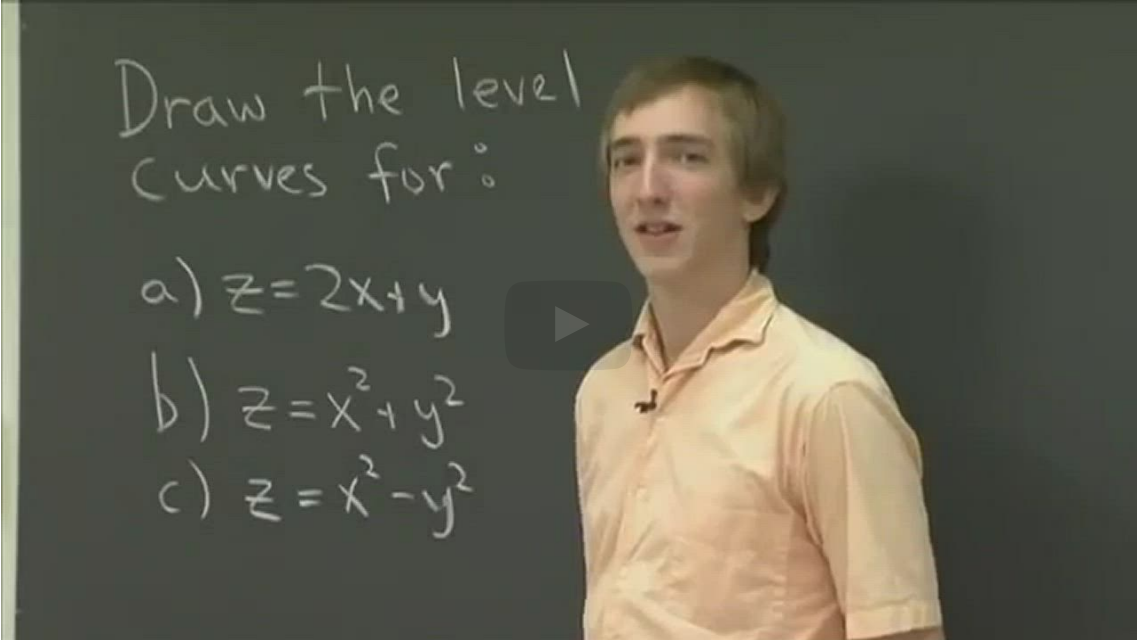


Reflect

Pause when prompted in the following video to try to sketch the contours yourself. After the video, we will explain a process to systematically draw level curves, and give you an opportunity to practice.

You can find more information about these recitation videos, which were made as part of OCW Scholar courses 18.01 and 18.02 [here](#).

Sketching contours



[Start of transcript. Skip to the end.](#)

PROFESSOR: Hello, and welcome back to recitation.

Today what we want to work on is drawing level curves.

This is for all the artists out there in the audience.

We have three functions here. z is $2x$ plus y , z is x squared plus y squared, and z is x squared minus y squared.

Video

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In order to sketch level curves for a function $f(x, y)$, start by considering a collection of evenly separated values, e.g. 0, 1, 2, etc.

Set the function equal to each value you wish to find a level curve for.

- $f(x, y) = 0$
- $f(x, y) = 1$
- $f(x, y) = 2$
- etc.

Next determine conditions on x and y so that the equation holds.

- You might try solving for y to end up with an expression $y = g(x)$ that you can plot.
- You might try solving for x to end up with an expression $x = h(y)$ that can be plotted.
- You might recognize the equation for a circle, or hyperbola, or other common shape



Calculator



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- You might plug in some points.

Example 16.1 Let's find the level curves of height **0** and height **1** for the function $f(x,y) = xy$.

Height 0 First we set $xy = 0$. This equation holds if either $x = 0$ or $y = 0$. The set of points where either x or y is zero describes the entire x -axis and y -axis.

Height 1 Next we set $xy = 1$. There are multiple approaches to plotting this function.

- We can rewrite this as $y = 1/x$ and plot this known function.
- We can plug in points to recognize that if $x = 2$, then $y = 1/2$, if $x = 1/3$, then $y = 3$ thus the two point values are always reciprocals.

You will plot these level curves (and more!) in the following problem.

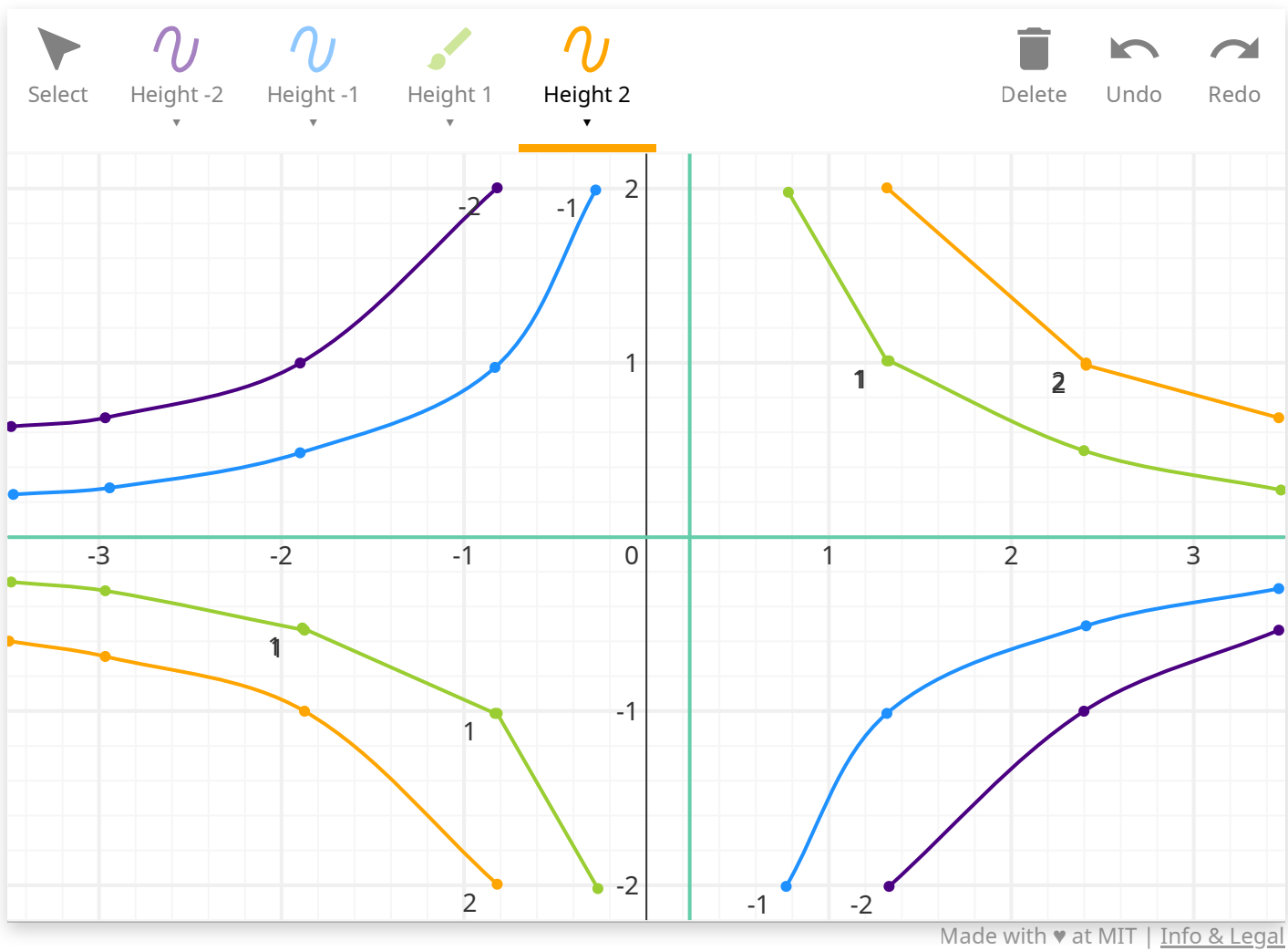
Sketch the level curves

1.0/1 point (graded)

Sketch the level curves of the function $z = xy$ of heights **1**, **2**, **-1**, and **-2**.

Note that there are 4 drawing tools. Each drawing tool corresponds to a level curve with a specific height. Be sure to use the correct tool to draw the correct level curve. We have drawn in the level curves of height **0** for you, which corresponds exactly to the x and y axes as described in the text above.

Note that when drawing the function, you may choose between using the freeform or spline drawing tool using the dropdown menu in the menu of the sketch response tool. The freeform tool draws like a regular pencil using your mouse. The spline tool allows you to pick a series of discrete points, and it then connects them (once you have two or more points) with a curve.



Answer: See solution.

✓
Good Job

Pro tip: When using the spline tool, to create a piecewise continuous function, select any other tool from the tool bar before reselecting the spline tool you want and then continue to draw your a disc Calculator Hide Notes the tools will automatically attempt to connect them!

the tools will automatically attempt to connect them!)

Solution:

See the pictures on the next page for the solution!

Submit

You have used 1 of 25 attempts

Answers are displayed within the problem

16. Sketching level curves

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Topic: Unit 1: Functions of two variables / 16. Sketching level curves

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