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2. Review

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Review

Recap of linear approximations

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PROFESSOR: OK, let's get started.

On Tuesday we talked about functions of several variables

and linear approximation.

And then yesterday, we talked about vectors.

And today we're going to start to put all of those ideas

together.

So let's start by doing a little recap of linear approximation

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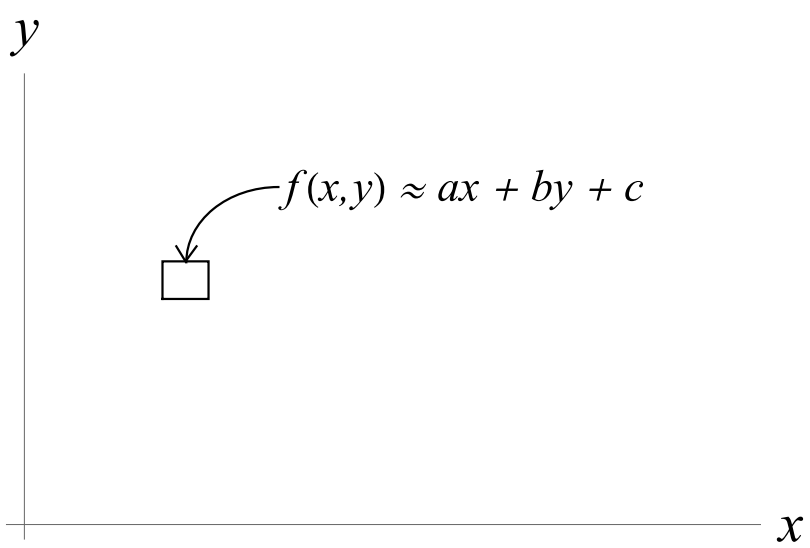
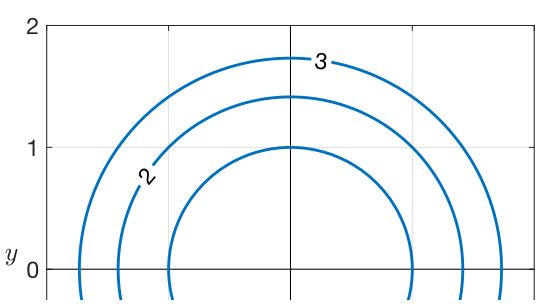
Let's say $f(x, y)$ describes some complicated function. If we restrict our attention to a very small box in x and y, we can approximate this function by a plane. This idea is illustrated in the figure below.



Example 2.1 In Lecture 1, we looked at the level curves of the function $f(x, y) = x^2 + y^2$, which are shown below.



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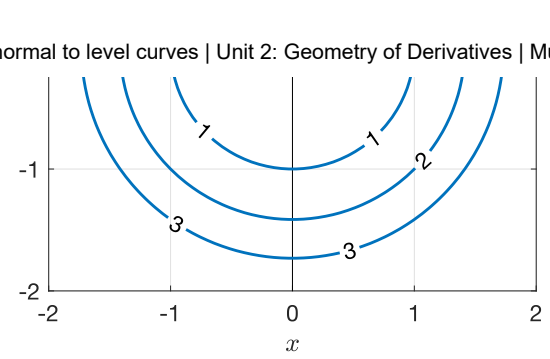
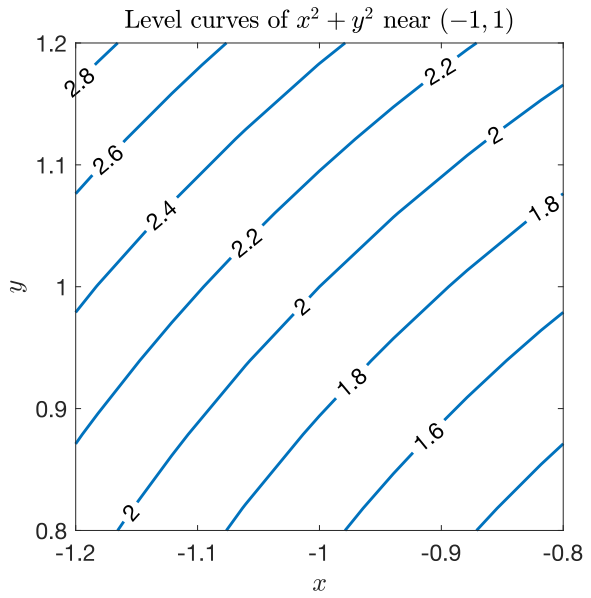
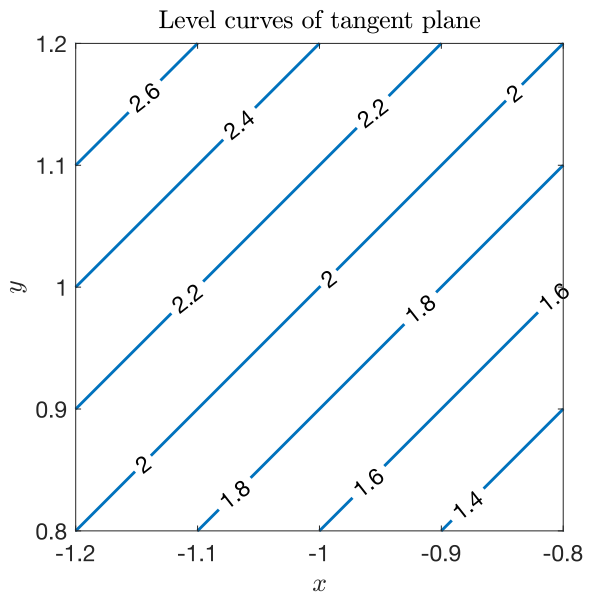


The idea that we can approximate this function by a plane is illustrated by zooming in near the point $(-1, 1)$. The level curves look almost like parallel lines. We can compare these level curves to the level curves of the tangent plane at $(-1, 1)$, which we found to be $z = x + y/2$.

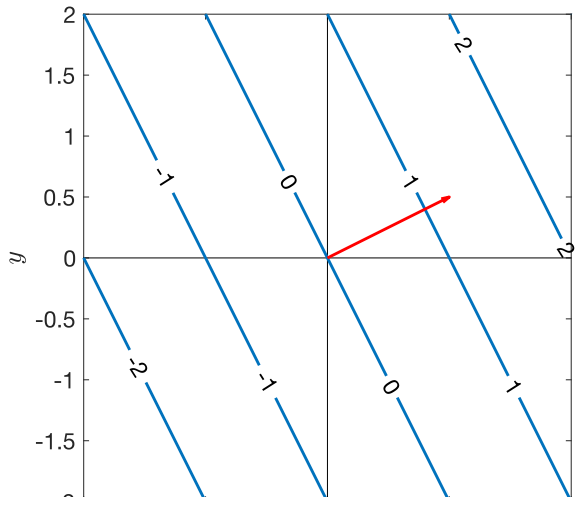




Next we'll look at the level curves of the function

$$z = x + \frac{1}{2}y.$$

One thing we might like to know is how to find a vector that is perpendicular to the level curves, like the one shown below.



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