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6. Summary of main ideas

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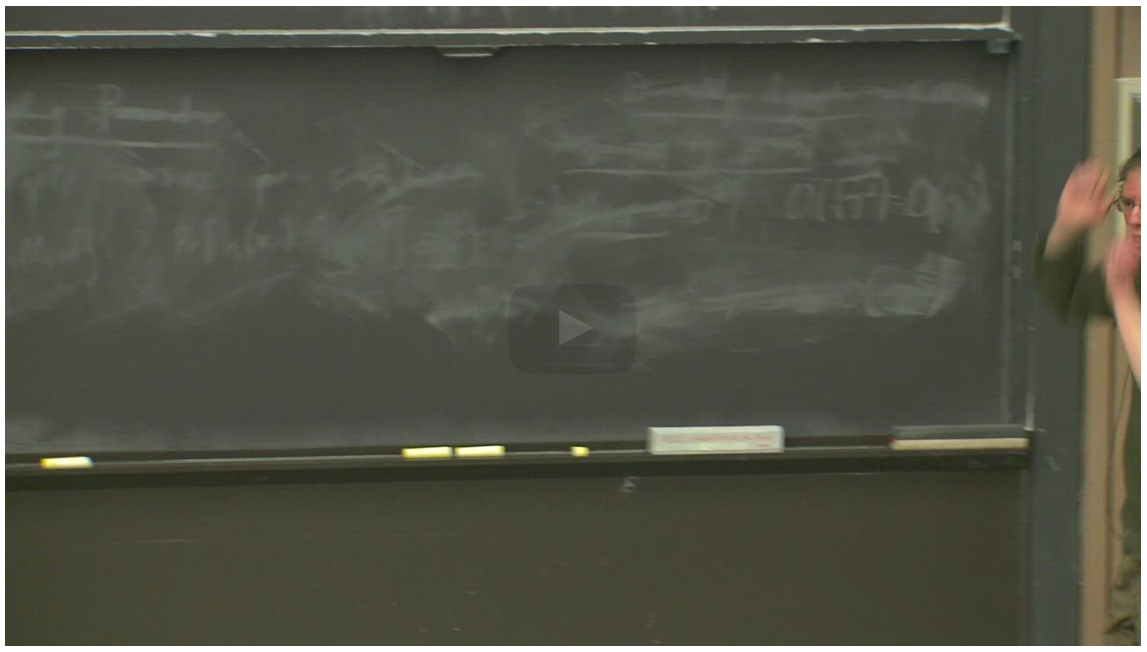
Summarize

Summary of argument

Start of transcript. Skip to the end.



PROFESSOR: So somebody made a comment to me

recently that in learning this stuff, something that's tricky

is--

So you learn some new stuff, and then there's an argument,

and there's a bunch of little steps in that argument.

0:00 / 0:00 2.0x

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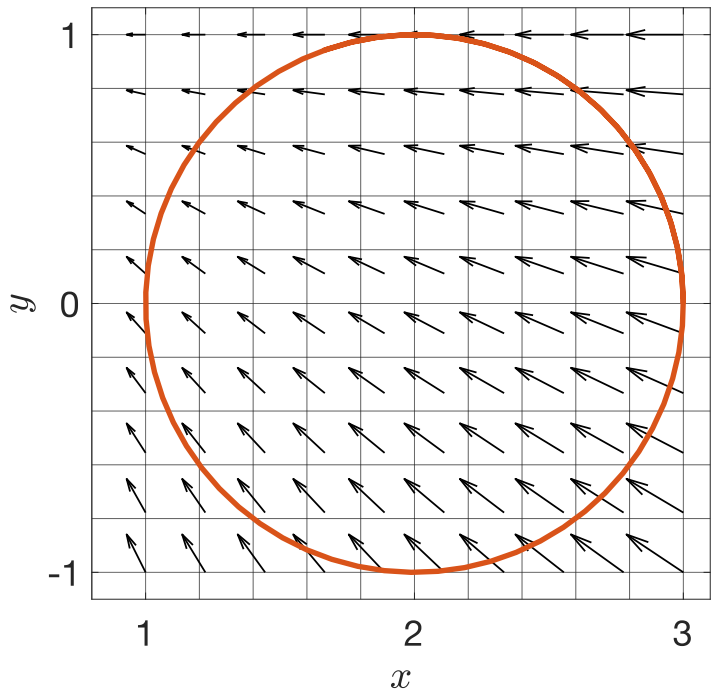
We have been exploring a function $f(x, y)$ constrained to a region R. The gradient of the function $f(x, y)$ and the region R, a circle of radius 1 centered at the point $(2, 0)$ are pictured below.



We have defined the function $g(x, y) = (x - 2)^2 + y^2$, whose level curve $g(x, y) = 1$ defines the boundary of the region R.

What we've discovered so far:

- ∇g is perpendicular to the boundary of R everywhere (because we've defined g so that its level curve is this boundary)
- ∇f is perpendicular to the boundary of R at the maximum point
- At the maximum point of f on this region R, ∇f is pointing in the same direction (o n

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This holds more generally.

Theorem The maximum (or minimum) of a function $f(x, y)$ constrained to a level curve $g(x, y) = c$ occurs where the gradient of the function is parallel to the gradient of the constraint equation:

$$\nabla f = \lambda \nabla g$$

for a real number λ.

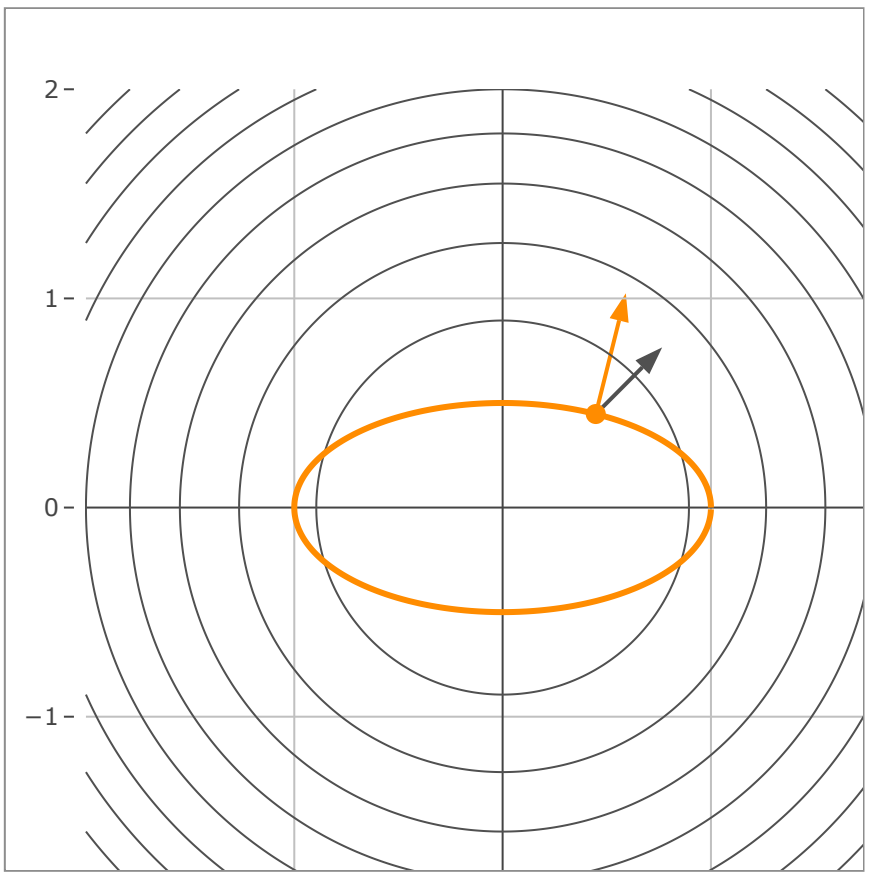
Pro tip: You must enable 3rd party cookies so that you can interact with the mathlet below.

Change functions and constraint equations using the dropdown menus, and observe the gradient vector of the function whose level curves are shown and the gradient vector of the constraint curve at the same point.

▸ Lagrange Multipliers

Equation 1 $z = f(x, y) = \dfrac{x^2 + y^2}{4}$

Constraint 1 $\dfrac{x^2}{4} + y^2 = 0.5$



x = 0.45 y = 0.45 f(x,y) = 0.10

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6. Summary of main ideas

Topic: Unit 3: Optimization / 6. Summary of main ideas

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- Good — wonderful — 2
- Summary — Couldn't agree more with whoever made the comment and thanks for responding to it! So often, having followed all the individual st... — 6
- Lagrange multiplier — This [video][1] about Lagrange multiplier from Prof. Robert Ghrist is the one of the best videos I have ever seen. [1]: https://youtu.be/... — 2
- [staff] Graph does not match equation — For "Equation 7" of the mathlet, the equation is "z = f(x,y) = 0.5*y*sin(2x)," but the graph seems to correspond to "z = f(x,y) = 0.5*y /... — 2
- The rating for this Mathlet is not activated — Community TA — 4

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