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9. Putting it together

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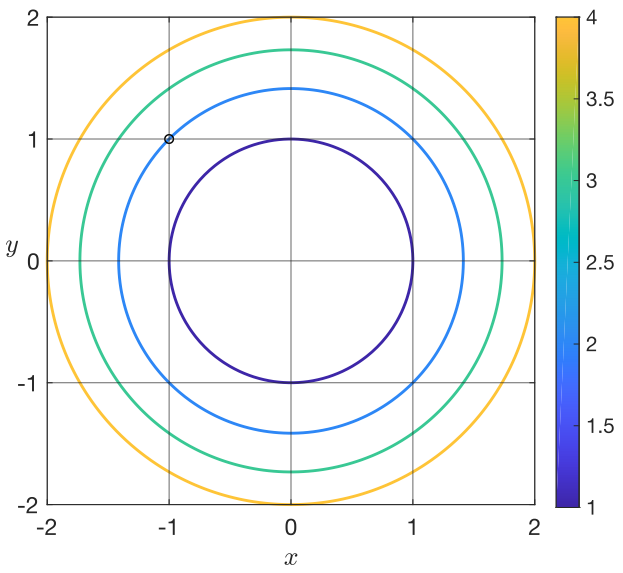
Lecture due Aug 18, 2021 20:30 IST Completed

Synthesize

Guess the direction of the gradient

1/1 point (graded)

Consider the paraboloid $f(x, y) = x^2 + y^2$ whose level curves are concentric circles.



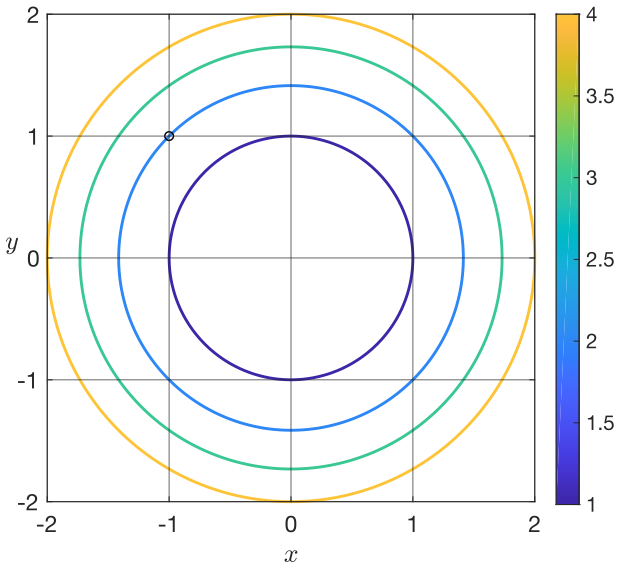
Which direction does $\nabla f(-1, 1)$ point?

- diagonally up and right
- diagonally up and left
- diagonally down and right
- diagonally down and left

✔

Solution:

The point $(-1, 1)$ is in the second quadrant on a concentric circle corresponding to the level curve of height 2.



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The gradient is normal to the level curve, therefore the two possible options are diagonally up and to the left, and diagonally down and to the right. Because the level curves are increasing as you move up and to the left, that is the direction of steepest increase.

Submit You have used 1 of 2 attempts

Answers are displayed within the problem

Estimate the size of the gradient

1/1 point (graded)
Estimate $|\nabla f(-1,1)|$.

- ○ $\approx 1/3$
- ○ ≈ 1
- ◉ ≈ 3 ✔

Solution:

Note that $\nabla f(-1,1) = \langle -2,2 \rangle$, which has length $= \sqrt{8} \approx 3$.

Submit You have used 1 of 2 attempts

Answers are displayed within the problem

Connection between gradient and 3D graph

0:00 / 0:00 2.0x

Start of transcript. Skip to the end.

PROFESSOR: So I have one more visual for you about--

let's get these out of the way.

OK, so let's come back to this picture.

So that's a picture of the gradient of the function

x squared plus y squared.

And we saw before that the gradient is always

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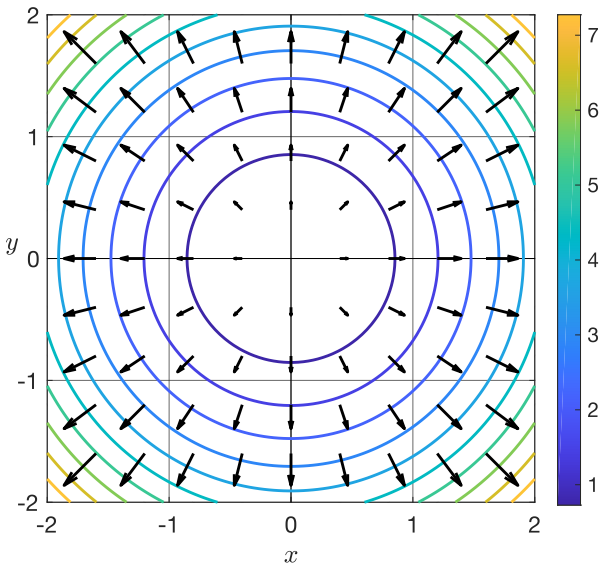
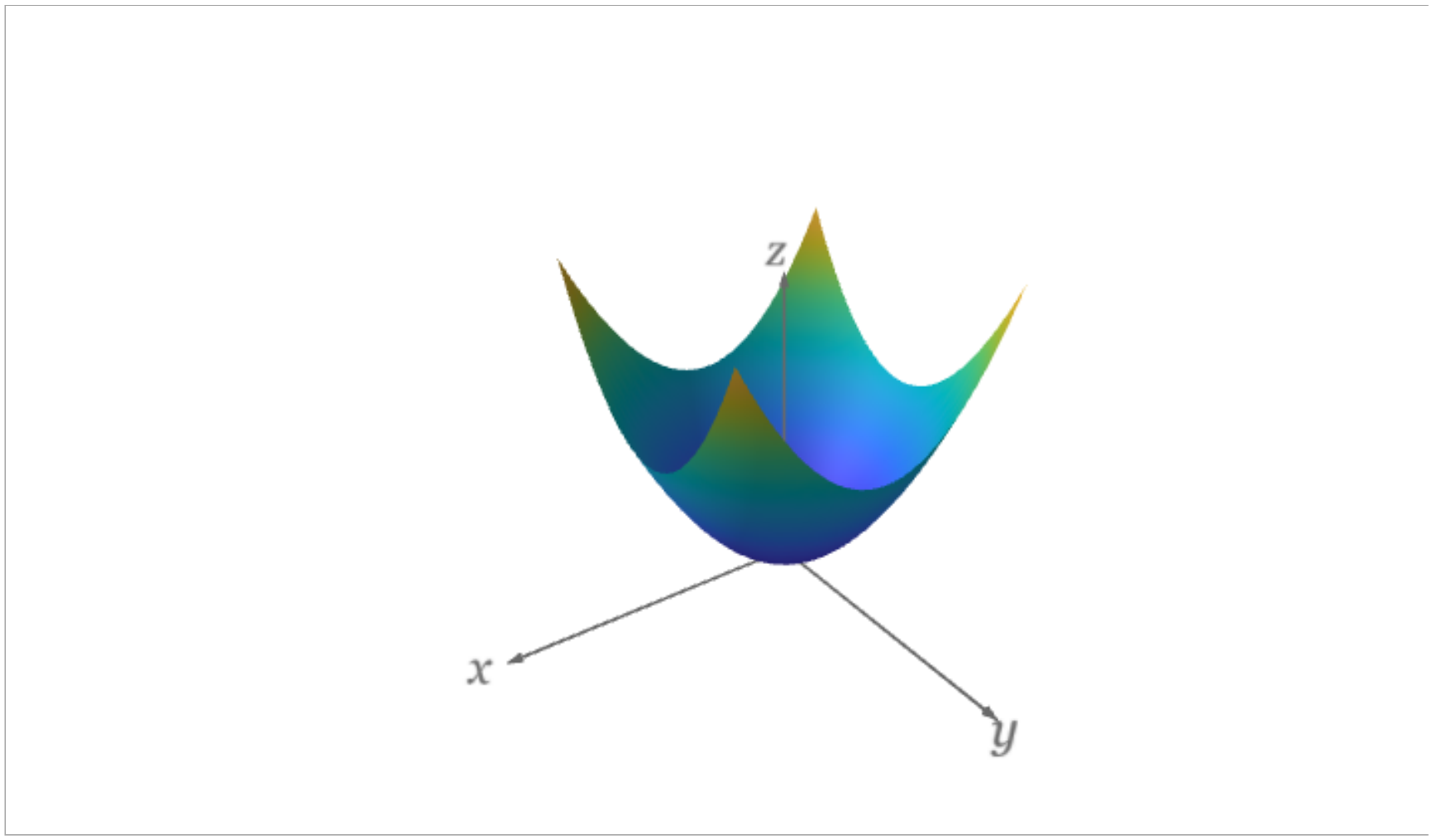
Looking back at the level curves of $f(x, y) = x^2 + y^2$ along with the gradient vectors, you can see that the gradient vectors are longer where the slope of the function is bigger. This means that $f(x, y)$ is steeper at those places. The 3D plot of the surface is shown below for comparison.



▶ **Paraboloid**



9. Putting it together

Topic: Unit 2: Geometry of Derivatives / 9. Putting it together

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[staff] number of attempts
Hello, For last question "Estimate the size of the gradient" there's 3 choices and 3 attempts. For previous question "Guess the directi... 2

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