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End My Exam 44:29:00

Previous Next

4. Tangent planes and approximations

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Problem Set A due Aug 4, 2021 20:30 IST Completed

1A-4A

1/1 point (graded)

Let $f(x,y) = y^2 - x^2$.

Compute the linear approximation $L(x,y)$ of $f(x,y)$ near the point $(1,1)$. (Express your answer in terms of x and y.)

$L(x,y) =$ 2*y-2*x

$2 \cdot y - 2 \cdot x$

✔ **Answer:** 2*y-2*x

? INPUT HELP

Solution:

To compute the linear approximation, we need the values

$$f(1,1) = 0$$

$$f_x(1,1) = -2(1) = -2$$

$$f_y(1,1) = 2(1) = 2.$$

Then the linear approximation of $f(x,y)$ near $(1,1)$ is

$$L(x,y) = f(1,1) + f_x(1,1)(x-1) + f_y(1,1)(y-1) = -2(x-1) + 2(y-1) = 2y - 2x.$$

Submit You have used 1 of 5 attempts

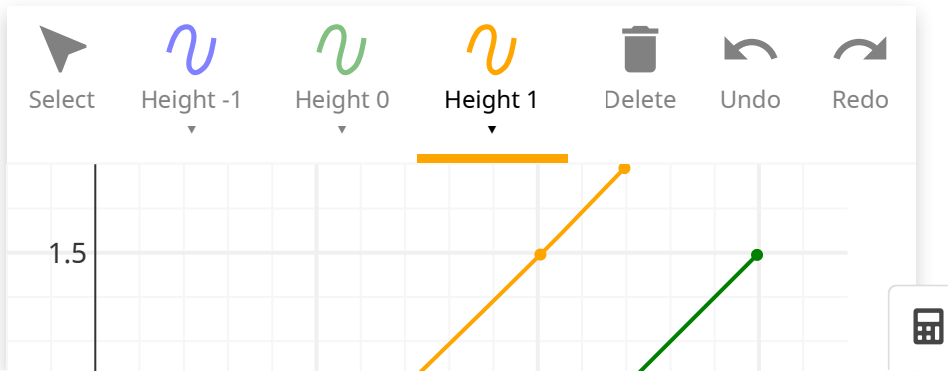
Answers are displayed within the problem

1A-4B

1.0/1 point (graded)

Sketch the level curves of $L(x,y)$ at the heights -1, 0, and 1.

Use the appropriate tool to draw each level curve– use the height 0 tool to draw the level curve of height 0, the height 1 tool to draw the level curve of height 1, etc.



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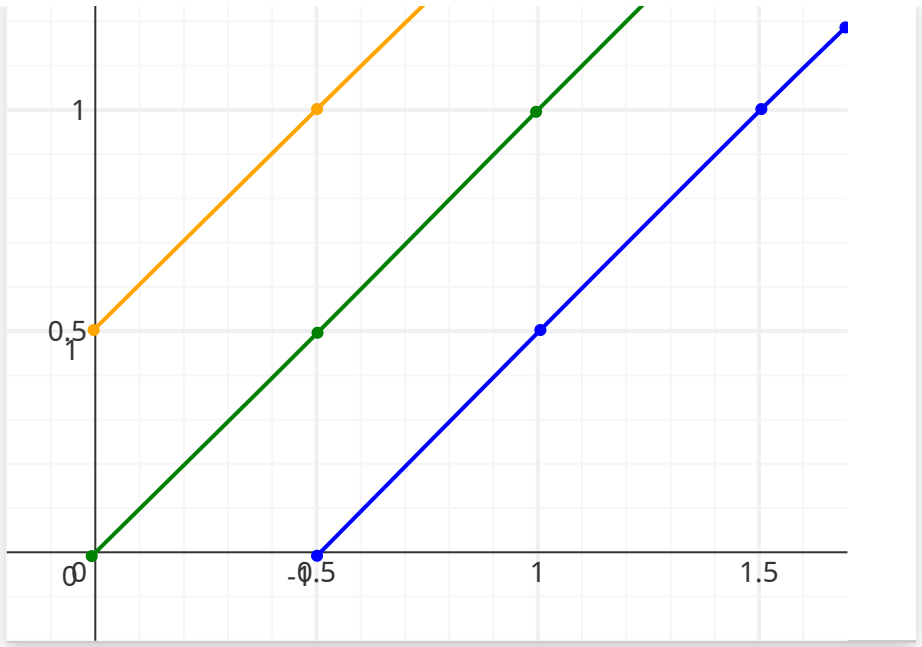


Answer: See solution.

✔

Good Job

Solution:

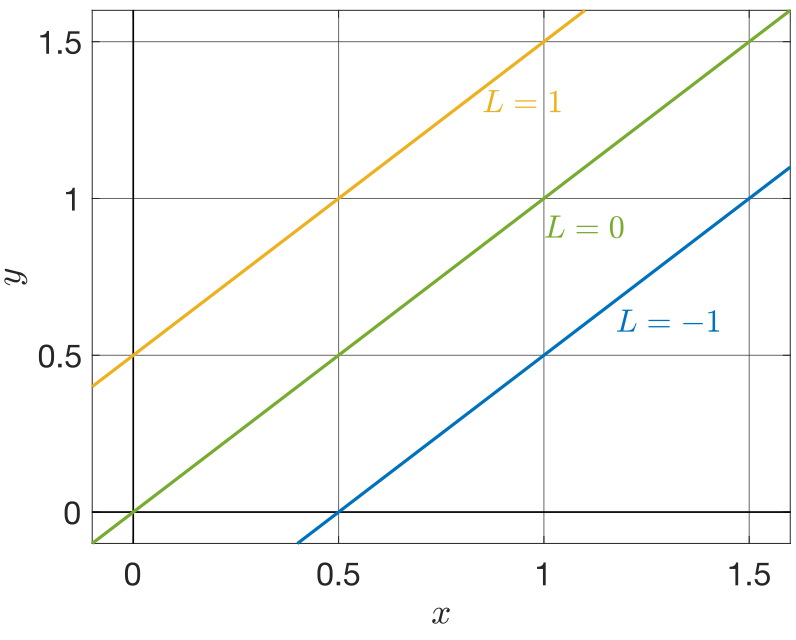
The level curves of $L(x, y)$ at heights -1, 0, and 1 are given by the following equations:

$$\textbf{Height -1: } 2y - 2x = -1 \implies y = x - \frac{1}{2}$$

$$\textbf{Height 0: } 2y - 2x = 0 \implies y = x$$

$$\textbf{Height 1: } 2y - 2x = 1 \implies y = x + \frac{1}{2}$$

Sketching these yields the following figure:



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4. Tangent planes and approximations

Hide Discussion

Topic: Unit 1: Functions of two variables / 4. Tangent planes and approximations

< Previous | Next >

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