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3. Level curves and partial derivatives

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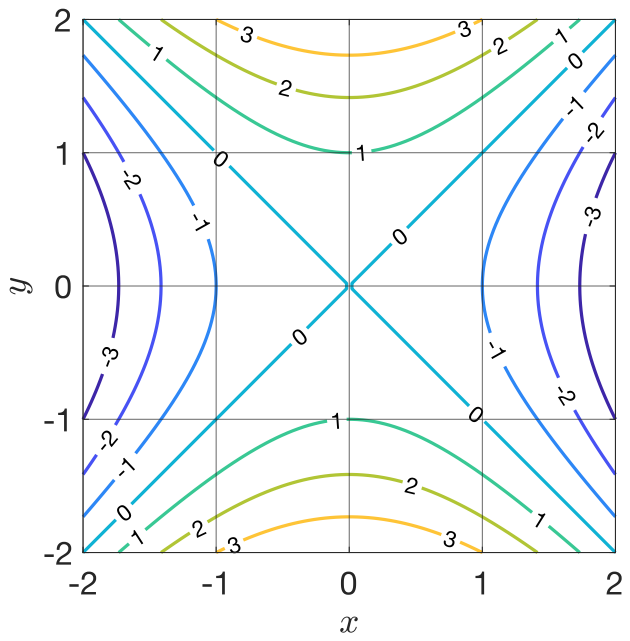
Problem Set A due Aug 4, 2021 20:30 IST Completed

1A-3

1.0/1 point (graded)

Consider the level curves shown below for the function $f(x,y) = y^2 - x^2$.



List all the points on the level curves of height 1 where $f_x(x,y) = 0$.

(Enter ordered pairs in parentheses, e.g. (x, y). If there is more than one point, separate with semicolons, e.g. (a, b); (c, d). You may type e for Euler's number, and pi for the mathematical constant π.)

(0,1);(0,-1) ✔ **Answer:** (0,1);(0,-1)

? INPUT HELP

Solution:

We can find these points in two ways. The first is from the level curves. By finding the level curves of height 1, we notice that they form two U-shaped curves in the xy-plane. The minimum and maximum of these curves indicate where $f_x = 0$. For example, the level curve of height 1 that lies above the x-axis has a minimum at $(0,1)$. Notice that if we start at that point and move to the left or right by a small amount, the function value decreases. This would indicate that $f_x(0,1) \leq 0$ and $f_x(0,1) \geq 0$, which means we must have $f_x(0,1) = 0$. A similar argument implies that $f_x = 0$ at $(0,-1)$.

Another way to find these points is to compute the partial derivative

$$f_x(x,y) = -2x.$$

Setting this equal to 0 gives $x = 0$. To solve for y, we substitute $x = 0$ into $f(x,y)$ and set $f(x,y) = 1$ to obtain

$$y^2 = 1 \implies y = \pm 1.$$

This gives the points $(0,1)$ and $(0,-1)$.

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Answers are displayed within the problem

3. Level curves and partial derivatives

Topic: Unit 1: Functions of two variables / 3. Level curves and partial derivatives

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1A3 - Solution issue After differentiating once we get f_x=-2x and we set x=0 in equation f(x,y)=1 to get the solution. Now if we double differentiate f_x w...	2
Is the Question wording correct? Is this the correct wording? "List all the points on the level curves of height 1 where f(x,y) =0"	4
Could not format HTML for problem. Contact course staff in the discussion forum for assistance. Hello everyone, I can't see this problem using any browser. Does anyone have the same problem?	3
1A-3 Question	4
Wrong choice of words in the solution I am not saying anything about the details of the solution, but the text calls the level curves a wrong name.	2

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