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10. Classifying critical points from the gradient

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Calculator



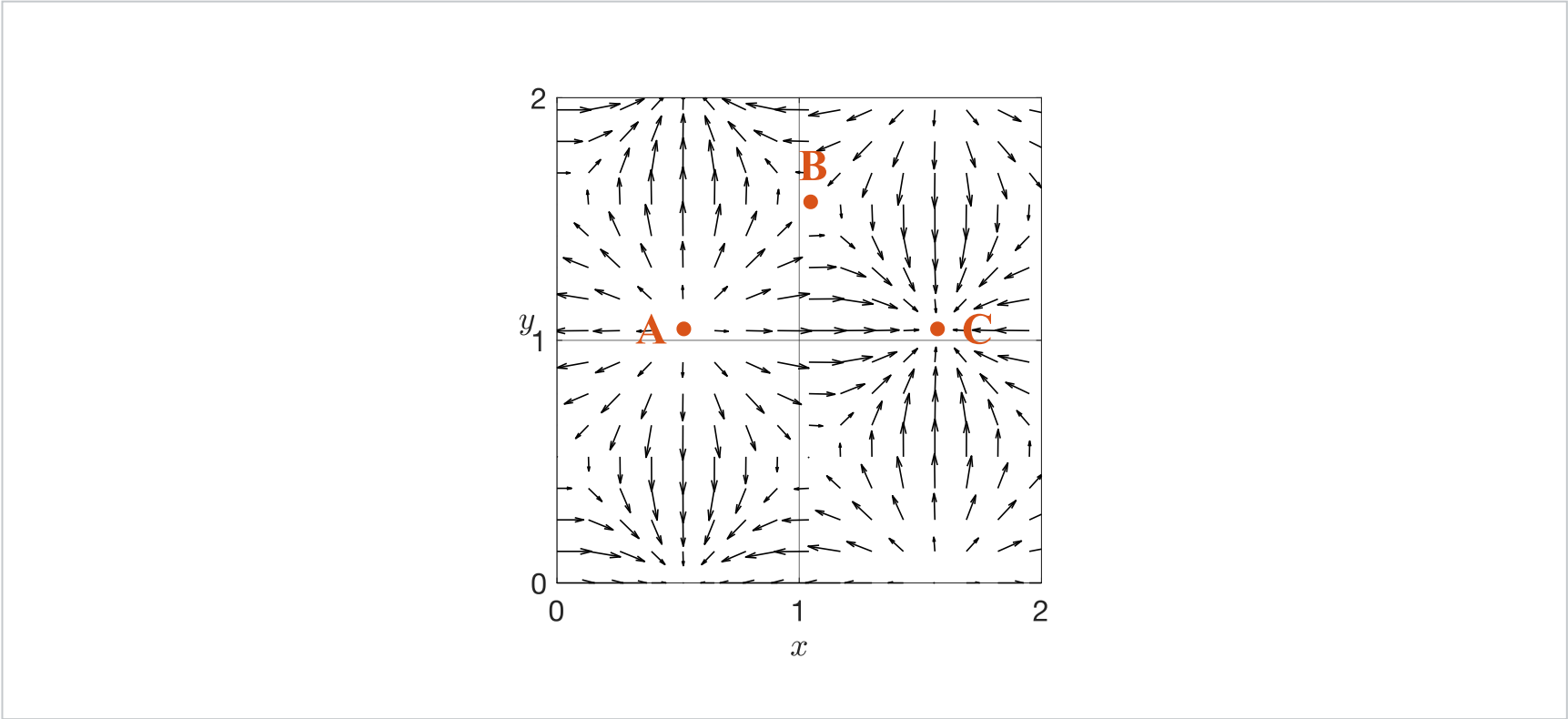
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Lecture due Sep 13, 2021 20:30 IST Completed

Classifying critical points 1

3/3 points (graded)

Consider the gradient field in the figure below. The points indicated by orange circles and labeled A, B, and C in the figure are critical points. Use what you know about the gradient to classify each critical point.



Point A is a	Point B is a	Point C is a
<input type="radio"/> local max	<input type="radio"/> local max	<input checked="" type="radio"/> local max
<input checked="" type="radio"/> local min	<input type="radio"/> local min	<input type="radio"/> local min
<input type="radio"/> saddle point	<input checked="" type="radio"/> saddle point	<input type="radio"/> saddle point
<input type="radio"/> Not enough information to determine	<input type="radio"/> Not enough information to determine	<input type="radio"/> Not enough information to determine
✓	✓	✓

Solution:

- Point A: All the vectors in the gradient field near A are pointing away from A. This means that the function is decreasing all around A until it reaches a local minimum at the point A.
- Point B: Vectors above B point to the left, vectors below B point towards the right, vectors to the right of B point downwards, and vectors to the left of B point upwards. The magnitude of the gradient is 0 at B, but the vectors in the gradient field show that the function is increasing in some directions around B and decreasing in others. This makes B a saddle point.
- Point C: All the vectors in the gradient field near C are pointing towards C. This means that the function is increasing all around C until it reaches a local maximum at the point C.

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You have used 1 of 2 attempts

Answers are displayed within the problem

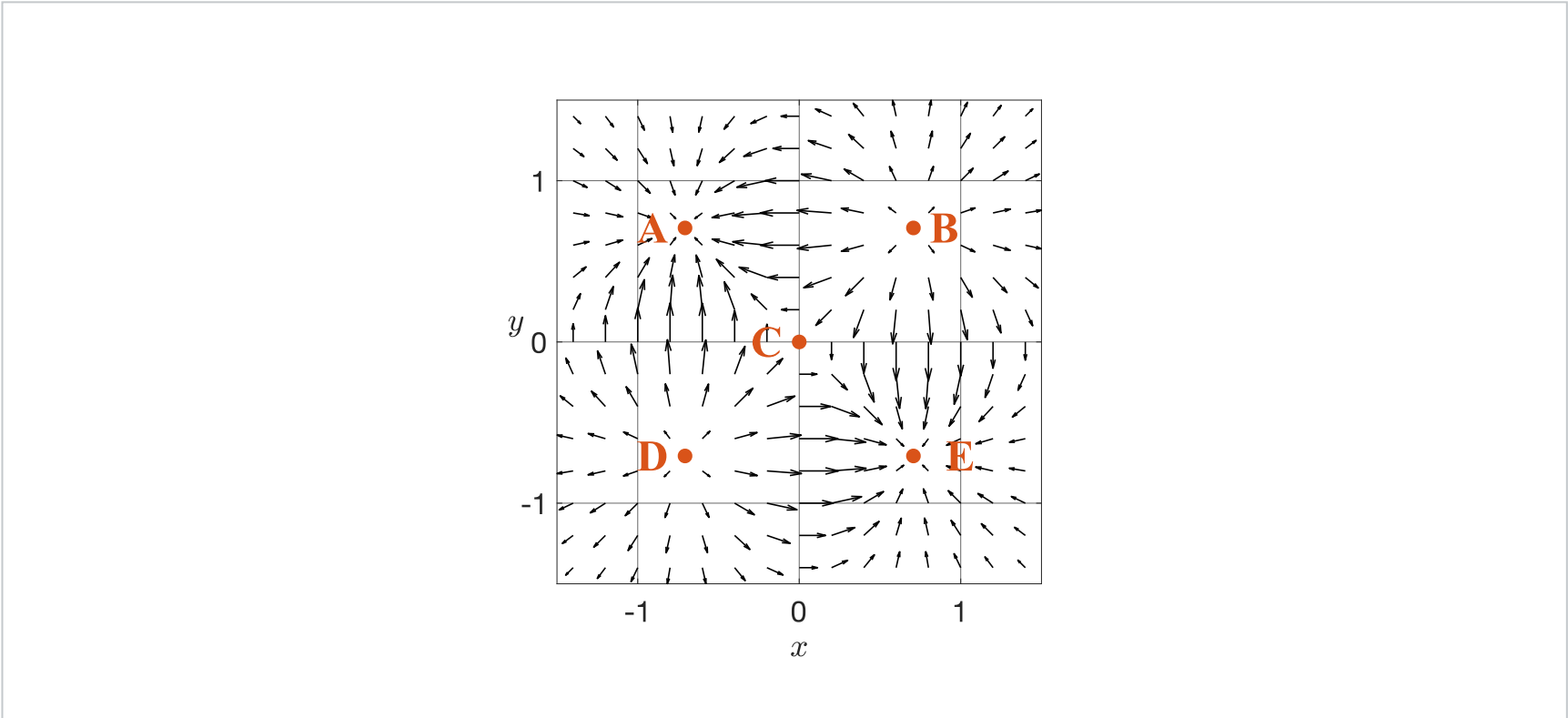
Classifying critical points 2

5/5 points (graded)

Consider the gradient field in the figure below. The points indicated by orange circles E in the figure are critical points. Use what you know about the gradient to classify ea

Calculator

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Point A is a	Point B is a	Point C is a	Point D is a	Point E is a
<input checked="" type="radio"/> local max	<input type="radio"/> local max	<input type="radio"/> local max	<input type="radio"/> local max	<input checked="" type="radio"/> local max
<input type="radio"/> local min	<input checked="" type="radio"/> local min	<input type="radio"/> local min	<input checked="" type="radio"/> local min	<input type="radio"/> local min
<input type="radio"/> saddle point	<input type="radio"/> saddle point	<input checked="" type="radio"/> saddle point	<input type="radio"/> saddle point	<input type="radio"/> saddle point
<input type="radio"/> Not enough information to determine	<input type="radio"/> Not enough information to determine	<input type="radio"/> Not enough information to determine	<input type="radio"/> Not enough information to determine	<input type="radio"/> Not enough information to determine
✓	✓	✓	✓	✓

Solution:

- Points A and E: All the vectors in the gradient field near A and E are pointing toward A and E. This means that the function is increasing all around those points until it reaches a local maximum at the points A and E.
- Points B and D: All the vectors in the gradient field near B and D are pointing away from B and D. This means that the function is decreasing all around those points until it reaches a local minimum at the points B and D.
- Point C: Vectors above C point to the left, vectors below C point towards the right, vectors to the right of C point downwards, and vectors to the left of C point upwards. The magnitude of the gradient is 0 at C, but the vectors in the gradient field show that the function is increasing in some directions around C and decreasing in others. This makes C a saddle point.

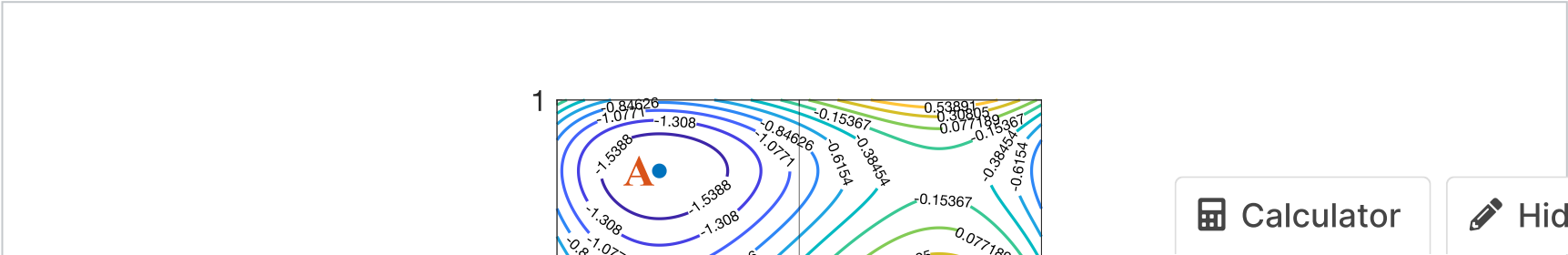
Submit

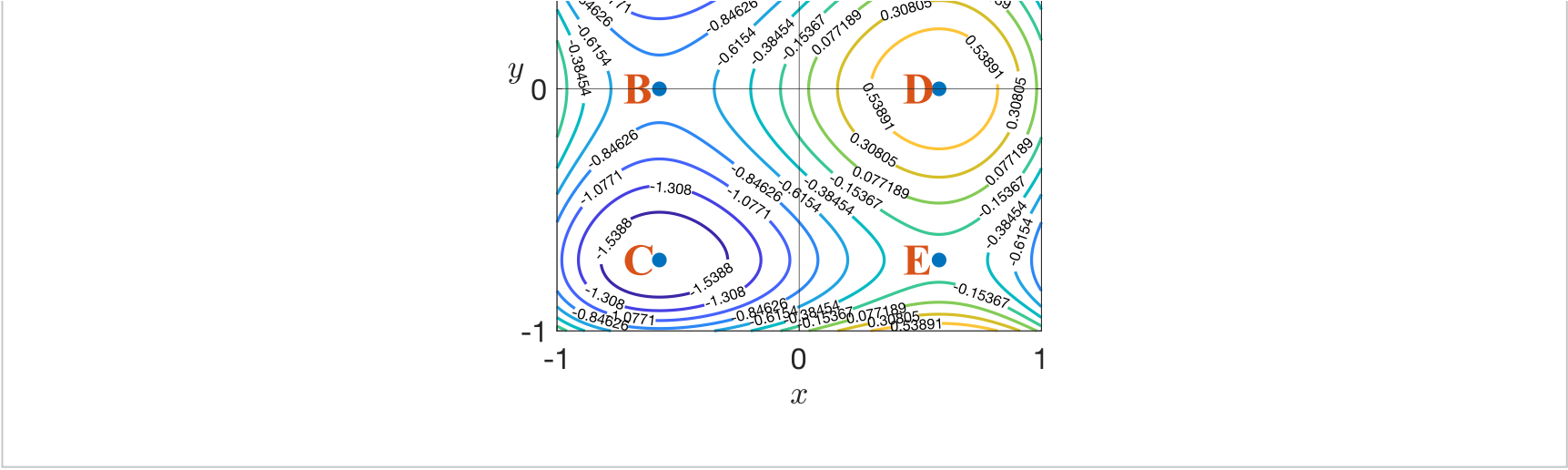
You have used 2 of 3 attempts

Answers are displayed within the problem

Classifying critical points 3

5/5 points (graded)
Consider the level curves in the figure below. The points indicated by blue circles and labeled A, B, C, D, and E in the figure are critical points. Use what you know about the level curves to classify each critical point.





Point A is a	Point B is a	Point C is a	Point D is a	Point E is a
<input type="radio"/> local max	<input type="radio"/> local max	<input type="radio"/> local max	<input checked="" type="radio"/> local max	<input type="radio"/> local max
<input checked="" type="radio"/> local min	<input type="radio"/> local min	<input checked="" type="radio"/> local min	<input type="radio"/> local min	<input type="radio"/> local min
<input type="radio"/> saddle point	<input checked="" type="radio"/> saddle point	<input type="radio"/> saddle point	<input type="radio"/> saddle point	<input checked="" type="radio"/> saddle point
<input type="radio"/> Not enough information to determine	<input type="radio"/> Not enough information to determine	<input type="radio"/> Not enough information to determine	<input type="radio"/> Not enough information to determine	<input type="radio"/> Not enough information to determine
✓	✓	✓	✓	✓

Solution:

- Points A and C: The level curves around A and C form closed curves that decrease in value. Therefore, A and C are local minima.
- Points B and E: The level curves near B and E form hyperbolas. Therefore B and E are saddle points.
- Point D: The level curves around D form closed curves that increase in value. Therefore, D is a local maximum.

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You have used 1 of 3 attempts

i Answers are displayed within the problem

10. Classifying critical points from the gradient

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Topic: Unit 3: Optimization / 10. Classifying critical points from the gradient

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[Staff] Typo in Classifying critical points 1	2
In the last sentence of the answer, *around **A** until it*, it should be *around **C** until it*. Thank you.	
Solution to the 1st problem	2
I think in the solution to the first problem the answer to point B seems to have got the wrong directions?	
[Staff] Q3: typo in the question	2
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