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☆ Course / Unit 3: Optimization / Lecture 9: Second derivative test



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Lecture due Sep 13, 2021 20:30 IST Completed Given a quadratic function

$$w(x,y) = ax^{2} + bxy + cy^{2} (4.63)$$

for a
eq 0, the three cases presented in the video on the previous page are as follows:

Case 1: If $4ac-b^2<0$, then $w\left(x,y\right)$ is a difference of squares. This implies that the origin is a saddle point .

Case 2: If $4ac - b^2 = 0$, then w(x, y) is constant in one direction, which means the origin is a degenerate critical point. We will not focus on this case in this course.

Case 3: If $4ac - b^2 > 0$, then w(x,y) is a sum of two squares. This means that the sign of w depends entirely on the term 1/(4a).

- If a>0, then $w\geq 0$ and the origin is a local minimum .
- If a < 0, then $w \leq 0$ and the origin is a **local maximum** .

Identify the critical point of the quadratic function, 1

1/1 point (graded)

Use the criterion above to determine what type of critical point (0,0) is for the quadratic function

$$-2x^2 + 3xy - 4y^2$$

Saddle	
O Degenerate	
Minimum	
Maximum	

Solution:

We look at the quantity $4ac-b^2=4(-2)(-4)-3^2=32-9>0$, thus we are in case 3. Since a<0, the origin is a maximum.

Submit

You have used 1 of 2 attempts

Answers are displayed within the problem

Identify the critical point of the quadratic function, 2

1/1 point (graded)

Use the criterion above to determine if the what type of critical point (0,0) is for the quadratic function

$$2x^2 + 3xy - 2y^2$$



Saddle	
Degenerate	
Minimum	
─ Maximum	
✓	
olution:	
/e look at the quantity $4ac-b^2=4\left(2 ight)\left(-2 ight)-3^2=-16-9<0$, thu addle.	s we are in case 1. The origin is a
Submit You have used 1 of 2 attempts	
Answers are displayed within the problem	
dentify the critical point of the quadratic function, 3	
(1 point (graded)) Use the criterion above to determine if the what type of critical point $(0,0)$ is	s for the quadratic function
$x^2+2xy+y^2$	
Saddle	
Degenerate	
Minimum	
○ Maximum	
✓	
olution:	
Ve look at the quantity $4ac-b^2=4\left(1 ight)\left(1 ight)-2^2=0$, thus we are in case oint.	e 2. The origin is a degenerate critical
Submit You have used 1 of 2 attempts	
Answers are displayed within the problem	
S. Cases to consider for a quadratic function	Histor Biography
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[Stail] Could the addit access be extended for a few more weeks: 5 Hi, dear staff. This is really a great course! The content are so well prepared and the TAs and the forum are so helpful. As a full-time ... [Staff] Case 2: We will not focus on this case in this course 14 I feel a bit sad when I see that an interesting case will not be developed further in class. Maybe some optional material can be adde... caption typo 2 Hello. You used "Identify the critical point of the quadratic function, 1" twice. Best wishes. Typo in lecture 3, case 3 2 **≜** Community TA Previous Next >

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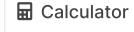


















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