Hedge Fund Quantitative Analyst Interview Report

Nbody Labs, Company

May 1, 2023

1 Interview Transcript

Below is the complete transcript of the interview. The topics covered in the interview are: Topic 1, ..., Topic n.

2 Technical Interview

Below are the questions and solutions generated by NBodyLabs.

2.1 Question #0:

Problem: Consider a function f(x, y) = x^2 + y^2. Find the critical points and determine their nature (maximum, minimum, or saddle point) using the second partial derivative test.

Difficulty: Medium

Topic: Calculus and Differential Equations

Reference Solution: To find the critical points of the function f(x, y) = x^2 + y^2 and determine their nature, we will follow these steps: \n\n1. Find the first partial derivatives of f with respect to x and y.\n2. Set the first partial derivatives equal to zero and solve for x and y to find the critical points.\n3. Use the second partial derivative test to determine the nature of the critical points.\n\nStep 1: Calculate the first partial derivatives.\n\nf_x = âˆ‚f/âˆ‚x = 2x\nf_y = âˆ‚f/âˆ‚y = 2y\n\nStep 2: Find the critical points by setting f_x and f_y equal to 0.\n\n2x = 0 => x = 0\n2y = 0 => y = 0\n\nThe critical point is (0, 0).\n\nStep 3: Apply the second partial derivative test.\n\nCalculate the second partial derivatives:\n\nf_xx = âˆ‚Â²f/âˆ‚xÂ² = 2\nf_yy = âˆ‚Â²f/âˆ‚yÂ² = 2\nf_xy = âˆ‚Â²f/âˆ‚xâˆ‚y = 0\n\nCompute the determinant of the Hessian matrix D = f_xx * f_yy - f_xy^2:\n\nD = 2 * 2 - 0^2 = 4\n\nSince D > 0 and f_xx > 0, the critical point (0, 0) is a local minimum.\n\nIn conclusion, the function f(x, y) = x^2 + y^2 has a single critical point at (0, 0), which is a local minimum.

Grading Rubric: {'rubric': [{'Question': 'Question Number 0', 'Rubric': [{'Part': 'Step 1: Calculate the first partial derivatives', 'Description': 'Correctly calculates the first partial derivatives of f with respect to x and y', 'Points': {'0': 'No attempt or incorrect calculation', '1': 'Partial correct calculation (only one correct partial derivative)', '2': 'Correctly calculates both f_x and f_y'}}, {'Part': 'Step 2: Find the critical points', 'Description': 'Sets the first partial derivatives equal to zero and solves for x and y to find the critical points', 'Points': {'0': 'No attempt or incorrect critical point', '1': 'Correctly identifies the critical point (0, 0)'}}, {'Part': 'Step 3: Apply the second partial derivative test', 'Description': 'Calculates the second partial derivatives and computes the determinant of the Hessian matrix', 'Points': {'0': 'No attempt or incorrect calculation', '1': 'Partial correct calculation (one or two correct second partial derivatives)', '2': 'Correctly calculates all second partial derivatives and computes the determinant'}}, {'Part': 'Step 3: Determine the nature of the critical points', 'Description': 'Uses the second partial derivative test to determine the nature of the critical points', 'Points': {'0': 'No attempt or incorrect determination', '1': 'Correctly determines the nature of the critical point (0, 0) as a local minimum'}}, {'Part': 'Overall structure and thought process', 'Description': 'Presents a clear and structured thought process throughout the solution', 'Points': {'0': 'Unclear or disorganized thought process', '1': 'Some structure and clarity, but with room for improvement', '2': 'Clear and structured thought process'}}]}]}

Feedback on Candidate Solution: The candidate provided a correct conclusion, stating that the critical point (0, 0) is a local minimum. However, they did not show the steps for calculating the first and second partial derivatives, finding the critical points, and applying the second partial derivative test. As a result, they did not achieve points in Steps 1, 2, and 3, but achieved 1 point in Step 4 for correctly determining the nature of the critical point and 1 point in Step 5 for overall structure and thought process.

Candidate Score: 2 / 9