308 notes 5.1-5.5

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This is a wild note

1 Two Examples

1.1 The Shortest Path between Two Points

Why can Taylor prove the shortest distance between two points by using $ds = \sqrt{dx^2 + dy^2}$? Isn't that circular logic?

1.2 Fermat's Principle

2 The Euler-Lagrange Equation

We have an integral of the form

$$S = \int_{x_1}^{x_2} f[y(x), y'(x), x]dx \tag{1}$$

where $y(x)$ is an as-yet unknown curve joining two points (x_1, y_1) and (x_2, y_2) with

$$y(x_1) = y_1 \qquad y(x_2) = y_2. \tag{2}$$

From now on, I understood the math part, but not quite sure why Taylor did it.

3 Applications of the Euler-Lagrange Equation

Boring examples. And still didn't specify how to determine min, max, or stationary points.

4 More than Two Variables.

Didn't understand anything...