



Calculus of Variations (Summer Term 2014)  
Assignment H2 - Homework

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**Problem 2.1 (10 Points)**

A brachistochrone is required to be constructed from a given curve  $g_1(x, y) = 0$  to a second given curve  $g_2(x, y) = 0$ . What relationships must satisfy the given curves at the respective points of intersection with the brachistochrone?

**Problem 2.2 (5 Points)**

Suppose that, in the solution of a specific isoperimetric problem, computation of the Lagrange multiplier yields the result  $\lambda = 0$ . What is the significance of this result?

**Problem 2.3 (5 Points)**

Given that

$$J[y] = \int_0^1 (y'^2 - y^2) dx$$

subject to the constraint

$$\int_0^1 \sqrt{1 + y'^2} dx = \sqrt{2},$$

and the end conditions  $y(0) = 0$  and  $y(1) = 1$ . Prove that  $J[y]$  achieves its minimum value for  $y = x$ .

**Deadline for submission:** Wednesday, May 21, 12 am