The Personal Computer Problem

A manufacturer of personal computers currently sells 10,000 units per month. The cost of manufacture is $700/unit, and the wholesale price is $950. During the last quarter, the manufacturer lowered the price $100 in a few test markets, and the result was a 50% increase in sales. The company has been advertising its product nationwide at a cost of $50,000 per month. The advertising agency claims that increasing the advertising budget by $10,000/month would result in a sales increase of 200 units/month. Management has agreed to consider an increase in the advertising budget to no more than $100,000/month.

Determine the price and the advertising budget that will maximize profit. Model as a constrained optimization problem, and solve using the method of Lagrange multipliers.