3.3: Constrained optimization (Lec 9)

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Remark. Imagine we want to maximize some function f subject to a constraint g. If we plot level curves of f alongside g, critical points occur where the level curves of f "kiss" the constraint curve, g. We can find where that happens by noting that where the curves kiss, the vectors normal to both curves are scalar multiples of each other. The vectors normal to level sets are gradients, so $\nabla f = \lambda \nabla g$.

Remark. If there are multiple extrains, critical points occur where $\nabla f = \lambda 1 \nabla g_1, \ldots, \nabla f = \lambda_n \nabla g_n$

Example (Steps to solve constrained optimization problem)**.**

1. Find $\nabla f, \nabla g$.
2. Solve the system of equations consisting of $\nabla f = \lambda \nabla g$ and the constraint(s) g
3. ???
4. profit