Section 14.8 – Lagrange Multipliers

Recall 14.7: Finding max/min value of $z = f(x,y)$ on a closed bounded set of $\mathbb{R}^2$

1.
2.
3.

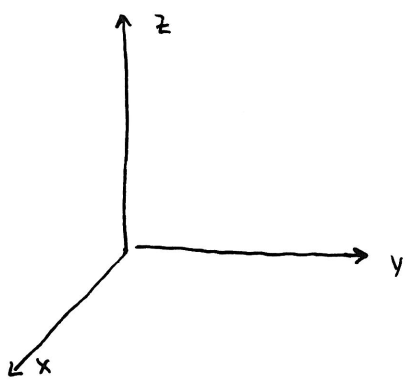
Now find the max/min value of $z = f(x,y)$ given some constraint on x and y

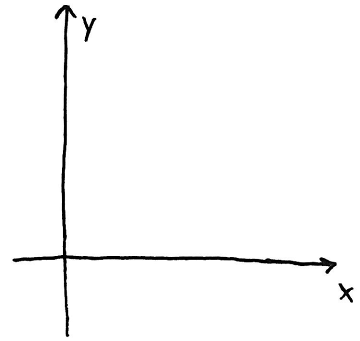
★ We'll look at the constaint on x and y when given by:

- Methods to find max/min:

  1. Constraint:

  2. Constraint:





- Method of Lagrange Multipliers:

  To Find max/min values of $f(x_1, x_2, \ldots, x_n)$ subject to $g(x_1, x_2, \ldots, x_n) = K$

  1.

  2.

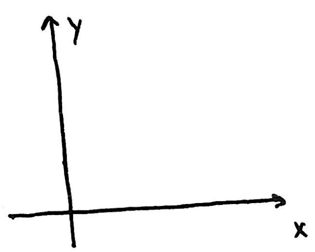
Section 14.8 - Lagrange Multipliers

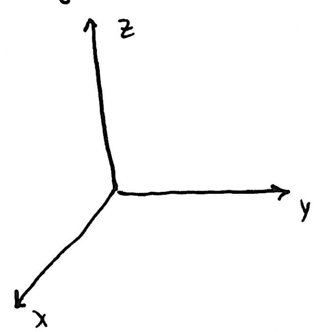
MVC

$\boxed{\text{Example}}$ Find the extreme values of $f(x,y) = x^2 + 2y^2$ on the circle $x^2 + y^2 = 1$.

$\boxed{\text{Example}}$ Find the points on the sphere $x^2 + y^2 + z^2 = 4$ that are closest and farthest from the point $(3,1,-1)$.

- Subject to Two Constraints: $f(\vec{x})$ subject to $g(\vec{x}) = k$ and $h(\vec{x}) = c$





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$\boxed{\text{Example}}$ Maximize $f(x,y,z) = x + 2y + 3z$ on the curve of inter-section $x - y + z = 1$ and $x^2 + y^2 = 1$.

#20 Find extreme values of $f(x,y) = 2x^2 + 3y^2 - 4x - 5$ on $x^2 + y^2 \leq 16$.

#22. Consider maximizing $f(x,y) = 2x + 3y$ Subject to $\sqrt{x} + \sqrt{y} = 5$. Try using Lagrange multiplies then show $f(25,0)$ is a bigger value but doesn't satisfy $\nabla f = \lambda \nabla g$ for any λ. Explain why Lagranges Method fails.