Algorithmic Operation Research
Homework 2

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Exercise 1

Find a differentiable function $f : \mathbb{R} \to \mathbb{R}$ such that f does not have an extremum at its critical point.
Solution:

Exercise 2

Given a positive integer S, which decompositions

$$a_1 + \cdots + a_n = S$$

with the a_i positive integers have the largest product $a_1 \cdots a_n$?
Solution:

Exercise 3

Find the optimal solution to the Diet Problem when the cost function is

$$Cost(x_1, x_2) = x_1 + x_2.$$

Solution:

Exercise 4

Let $A, B \in \mathbb{R}^{nxn}$. Show that the traditional way of computing their product AB requires a total of $(2n-1)n^2$ arithmetic operations.
Solution:

Exercise 5

Consider the problem of solving a system of n linear equations in n unknowns. Show that the Gaussian elimination method requires $\mathcal{O}(n^3)$ arithmetic operations in order to either compute a solution or to decide that no solution exist.

Solution:

Exercise 6

Suppose that we are given a set of vectors in $\mathbb{R}^n$ that form a basis and let y be an n arbitrary vector in $\mathbb{R}^n$. We wish to express y as a linear combination of the basis vectors. How can this by accomplished?
Solution:

Exercise 7

Study the paper with title: "Do dogs know Calculus?" found in the Readings folder.
Solution: