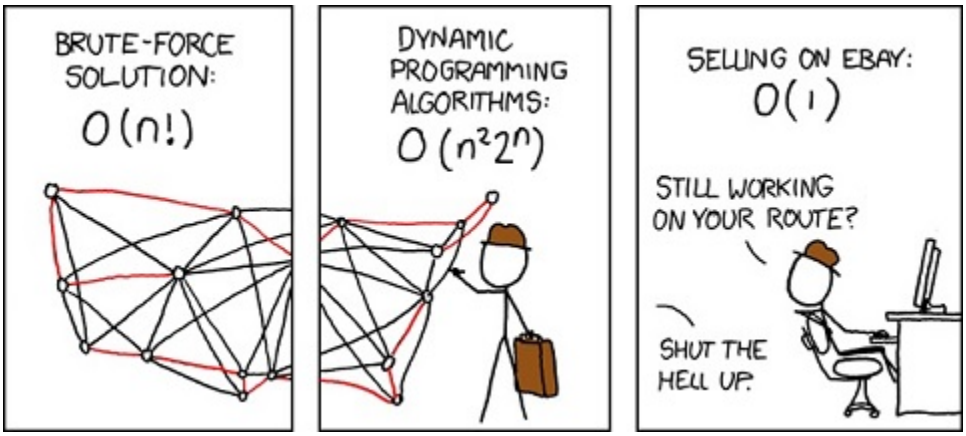
CSCI 270 Lecture 27: Numerical and Partitioning Problems

Travelling Salesman Problem

Given a set of n cities, a distance function $d(u, v)$ which specifies the distance between any two cities u and v, and a value D, find a tour of length $\leq D$.

From the comic XKCD:



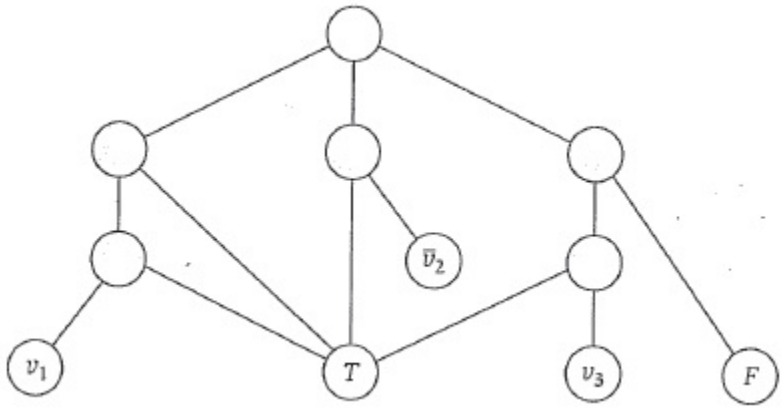
Subset Sum

Given n positive integers $w_1, w_2, ..., w_n$ and a target W is there a subset of integers which add up exactly to W?

		x_1	x_2	x_3	C_1	C_2	C_3	C_4
v_1	=	1	0	0	1	0	0	1
v'_1	=	1	0	0	0	1	1	0
v_2	=	0	1	0	0	0	0	1
v'_2	=	0	1	0	1	1	1	0
v_3	=	0	0	1	0	0	1	1
v'_3	=	0	0	1	1	1	0	0
s_1	=	0	0	0	1	0	0	0
s'_1	=	0	0	0	2	0	0	0
s_2	=	0	0	0	0	1	0	0
s'_2	=	0	0	0	0	2	0	0
s_3	=	0	0	0	0	0	1	0
s'_3	=	0	0	0	0	0	2	0
s_4	=	0	0	0	0	0	0	1
s'_4	=	0	0	0	0	0	0	2
t	=	1	1	1	4	4	4	4

3-Color

Given an undirected graph $G = (V, E)$, is there a way to assign one of 3 colors Red, Green, and Blue, to each node, so that no two adjacent nodes have the same color?



4-Color

Given an undirected graph $G = (V, E)$, is there a way to assign one of 4 colors Red, Green, Blue, and Purple to each node, so that no two adjacent nodes have the same color?