Graph $G$ is
1) undirected
2) weighted
3) complete
4) satisfies the triangle inequality $V_{u,v,w} \ c(u,w) \leq c(u,v) + c(v,w)$

TSP solved by trying all permutations

```
5 3 1 6 3
a  b  c  d  a  16
a  c  b  d  a  15
```

$|V-1|! = 3! = 6$

MST (Prim)  Pre order walk

```
a \[d
| c \[b
```

Cost of pre order walk no more than twice cost of optimal tour.

Let $C(T)$ be the cost of an MST and $C(H^*)$ be the cost of an optimal tour.

$C(T) \leq C(H^*)$

A full walk lists vertices when first and when subtree visited and
then again when recursion unwinds.

$w = a \ c \ b \ c \ a \ d \ a \ c(w) = 2C(T)$

$C(w) = 2C(T) \leq 2C(H^*)$

$w$ is not a tour.

By the triangle inequality, remove all but first visit.

$H = a \ c \ b \ d$

$C(H) \leq 2C(H^*)$