What if we have lots of edges but want to use a minimal number of edges to be able to reach everywhere?

Definition:

A _____ of a graph $\mathcal{G}$ is a tree formed by using edges and vertices of $\mathcal{G}$ containing all vertices of $\mathcal{G}$.

Example: Consider the graph below. Remove edges as appropriate to make a spanning tree of $\mathcal{G}$.

Example: Use the Breadth-First Search Algorithm to help you create a spanning tree for the graph below.

Definition:

A spanning tree constructed by means of the breadth-first search algorithm is called a _____.

Theorem 5.6:

A graph is connected if and only if it has a spanning tree.

Why should this make sense?

Definition:

In a weighted graph, the _____ is the sum of the weights of the edges in the tree.

A _____ in a weighted graph is a spanning tree for which the weight of the tree is as small as possible. A _____ in a weighted graph is a spanning tree for which the weight of the tree is as large as possible.

How can we approach creating a minimal spanning tree or maximal spanning tree?

Example: Use Prim's algorithm to find a minimal spanning tree and maximal spanning tree for the graph below. Give the weight of each.

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