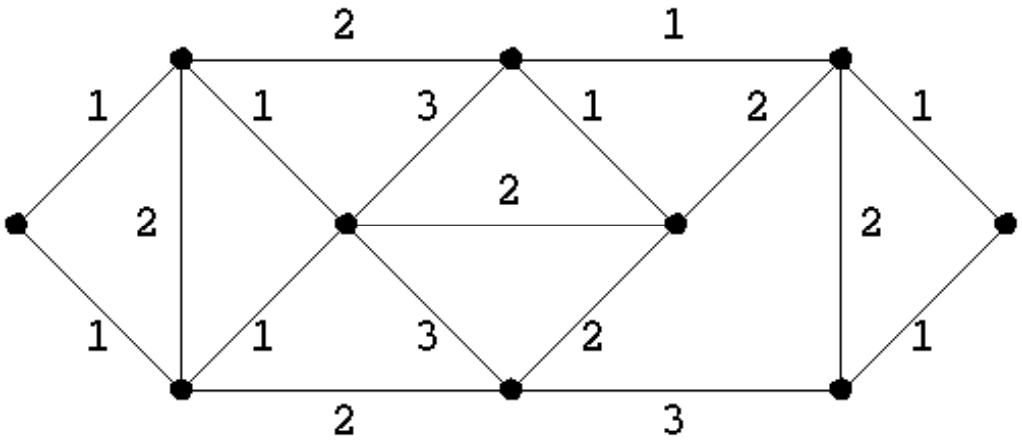
ASSIGNMENT 5—DUE FRIDAY, MARCH 9, 2007

Note: You may find it helpful to read Ore's Chapter 3 on trees (and, in particular, his section 3.3 on minimal spanning trees, under the name "economy trees").

1. Draw a picture of every tree with 1, 2, 3, 4, 5, or 6 vertices. Just include one copy of each tree—that is to say, you should eliminate any trees that are isomorphic to others on your list.

2. A large company wishes to install a pneumatic tube system that would enable small items to be sent between any of 10 locales, possibly by relay.

   a) If the costs (of the not-prohibitively-expensive potential links) are shown in the graph below, between which sites should tubes be installed to minimize the total cost?



   b) If the weight of each edge is increased by 1, will your tree from part (a) still achieve minimum cost for the new set of weights?

   c) Is your tree from part (a) unique? Explain your answer.

3. Write at least one paragraph, illustrated with at least one diagram, on the following question:

   > Imagine constructing a system of tunnels connecting the major academic buildings and dormitories at Oberlin—including about a dozen buildings. The tunnels wouls allow students living on campus to attend classes without risking frostbite, sunburn, or wet feet. The cost of constructing a tunnel between a particular pair of buildings will depend on their distance, any underground obstacles, etc. One way to minimize the cost of such an ambitious project would be to estimate the cost of each possible tunnel, and then use a minimum cost spanning tree design for the tunnels.

   a) Does this seem reasonable for Oberlin's campus?

   b) Can you imagine any types of campus layout for which a minimal spanning tree *would* be a good way to connect the major buildings for pedestrians?