Please use lots of space and explain your answers, showing clearly any work you had to do. Each question is worth 5 points.

## Section 11.1 Introduction to trees

- (1) Which of these graphs are trees?
  - (a)  $K_2$  (b)  $C_5$  (c)  $K_{1,5}$  (d)  $K_{2,4}$
- (2) For this rooted tree:
  - (a) Which vertex is the root?
  - (b) Which vertices are internal?
  - (c) Which vertices are leaves?
  - (d) Which vertex is the parent of *h*?
  - (e) Which vertices are children of *i*?
  - (f) Which vertices are siblings of *o*?
  - (g) Which vertices are ancestors of *n*?
  - (h) Which vertices are descendents of *b*?



- (3) The saturated hydrocarbon pentane has chemical formula  $C_5H_{12}$ . Draw two different possible arrangements of the hydrogen and carbon atoms of pentane. (Your two arrangements should be non-isomorphic trees, called isomers.)
- (4) Let *T* be a full 3-ary tree with 700 vertices.
  - (a) How many edges does *T* have?
  - (b) How many internal vertices does *T* have?
  - (c) How many leaves does *T* have?
- (5) For the rooted tree shown in question (2) answer these questions:
  - (a) Is it a 3-ary tree?
  - (b) Is it a full 3-ary tree?
  - (c) What is its height?
  - (d) Is it balanced?

If you get stuck on a question or aren't sure if you understand it:

- Go over the relevant class notes or section in the textbook.
- Ask me about it after class.
- Come to my office hours: Mon 2:00 3:00, Wed 2:00 3:00 in CP 317.
- Go to the Math Tutorial Lab in-person in CP 303 or online.