Homework 1 — assigned Wednesday 13 February — due Friday 22 February

1.1 Prolog evaluation (50pts)

Given the following Prolog database:

\[
\begin{align*}
a(a,b). \\
a(a,c). \\
a(b,d). \\
a(b,e). \\
a(c,d). \\
a(c,e). \\
a(d,f). \\
a(e,f). \\
b(X,Y) & : a(Y,X). \\
c(X,Y) & : a(X,Y). \\
c(X,Y) & : a(X,Z), c(Z,Y). \\
d(X,X). \\
d(X,Y) & : c(X,Y). \\
e(X,Y) & : a(X,Z), b(Z,Y). \\
f(X,Y) & : a(X,Y). \\
f(X,Y) & : f(X,Z), f(Z,Y). \\
\end{align*}
\]

what are Prolog’s answers to the queries below? For each query, give all Prolog’s answers (in the proper order), as if the user kept hitting ; repeatedly. In addition to giving Prolog’s answers, show how these answers are arrived at.

1. ?- b(c,Y).
2. ?- c(c,Y).
3. ?- d(X,d).
4. ?- e(e,Y).
5. ?- e(X,c).
6. ?- f(a,Y).

1.2 Prolog compound terms and data structures (50pts)

Adopt the following definition: void is the empty binary tree; if left and right are binary trees, so is tree(x, left, right), where x is called the root.

Define a predicate bintree such that bintree(T) means that T is a binary tree according to the above definition. Define a predicate treemember such that treemember(E,T) means that E is an element of
the tree $T$ (either its root, or the root of some subtree). Define a predicate $\text{inorder}$ to accomplish in-order traversal of a binary tree, viz., $\text{inorder}(T,L)$ means that the list $L$ is obtained by an in-order traversal of the tree $T$.

**How to turn in**

Submission instructions: see course mailing list.

Include the following statement with your submission, signed and dated:

*I pledge my honor that in the preparation of this assignment I have complied with the University of New Mexico Board of Regents’ Policy Manual.*