Homework #2

Due Date: Thursday, Feb. 26th, 2009 (in class)
(late assignments will NOT be accepted)

Solve the following problems:

1) Exercise 3.5 page 110. The "sum" procedure is shown in page 109.  
   (15 pts)

2) Problem 10 in page 141, but after adding another case "e", where  
   both parameters x and y are passed by value-result. For each case,  
   show the changes to the values of all involved variables (i.e.,  
   array A and i, in the caller block; and x and y in the callee P) as  
   you step executing in the code.                          
   (30 pts)

3) Given the following ALGOL code:       
   (total of 55 pts)

   (* please notice any text between (*..*) is a comment. Also, all  
   labels blk1, blk2, blk3 are not part of the program, they just to  
   show you the starting of blocks’ codes.*)

   main: begin (* main program block definition *)
   integer  a, b; real  c;
   procedure P1 (x); value x ; integer x;
   blk1: begin integer f;
   blk2: begin real r; r := y + b; PrintInteger(r); end;
   blk3: begin integer b;  b := z+ 25;  P11(b)  end;
   (* blk1 code *)
   f := x + b;     P12(f);
   end (* blk1 code *)
   begin (* the main program (block) code *)
   a := 15;     b := 20;     c := 1.7;    P1(a)
   end (* end of main program (block) code *)
   end (* end of main program (block) definition *)
a) What would be the printed value of "r", in blk2 above, in each of the following scoping mechanisms: i) static? ii) dynamic? You must show the picture of the system stack upon the execution of the "PrintInteger(r)". (20 pts)

b) Draw the contour diagram of the above ALGOL program and answer the following questions, based on that diagram: (6 pts)

   i) Can we call P11() in the main block main?
   ii) Can we call P1() in blk3?
   iii) Can we call "blk1" in P12()?

c) If we just imagine that we had created a sibling procedure to P1() that is immediately declared after P1(), call it Q1(), and it had the exact structure of P1(), with the renaming of the internal procedures P11() to be Q11(), and P12() to be Q12(). Remember, both P1() and Q1() are siblings in the "main" block (program). Now, answer the following questions:

   i) List the names of all procedures that are visible to be called from within the code of: Q1(), Q12(), P11(), and P1(); assuming static scoping. (12 pts)

   ii) If we assume dynamic scoping, can we still use the contour diagram to answer part "i" above? Justify your yes/no answer. (7 pts)

   iii) In case of dynamic scoping, is there a scenario that allows the calling of procedure P11() from within Q12()? ONLY when you answer YES, show such scenario. (10 pts)

4) EXTRA CREDIT: (15 pts)

   Would you consider the dynamic scoping mechanism a violation of the abstraction that is introduced via the static nesting of scopes? Justify your yes/no answer.