HW: Integer Programming

1. The Cubs are trying to determine which of the following free agent pitchers should be signed: Rick Sutcliffe (RS), Bruce Sutter (BS), Dennis Eckersley (DE), Steve Trout (ST), Tim Stoddard (TS). The cost of signing each pitcher and the number of victories each pitcher will add to the Cubs are shown below. Subject to the following restrictions, the Cubs want to sign the pitchers who will add the most victories to the team.

Pitcher	Cost of Signing Pitcher (Millions $)	Victories Added to Cubs
RS	6	6 (righty)
BS	4	5 (righty)
DE	3	3 (righty)
ST	2	3 (lefty)
TS	2	2 (righty)

(a) At most, $12 million can be spent.
(b) If both DE and ST are signed, then BS cannot be signed.
(c) At most two right-handed pitchers can be signed.
(d) The Cubs cannot sign both BS and RS.
Formulate an IP to help the Cubs determine who they should sign.

2. State University must purchase 1,100 computers from three vendors. Vendor 1 charges $500 per computer plus a delivery charge of $5,000. Vendor 2 charges $350 per computer plus a delivery charge of $4,000. Vendor 3 charges $250 per computer plus a delivery charge of $6,000. Vendor 1 will sell the university at most 500 computers; vendor 2, at most 900; and vendor 3, at most 400. Formulate an IP to minimize the cost of purchasing the needed computers.

3. Use the branch-and-bound method to solve the following IP:

$$\max z = 3x1 + x2$$
$$\text{s.t.} \quad 5x1 + x2 <= 12$$
$$2x1 + x2 <= 8$$
$$x1, x2 >= 0;\ x1, x2 \text{ integer}$$

4. Use the branch-and-bound method to solve the following IP:

$$\max z = 3x1 + x2$$
$$\text{s.t.} \quad 2x1 + x2 <= 6$$
$$x1 + x2 <= 4$$
$$x1, x2 >= 0;\ x1 \text{ integer}$$