Assignment 15

▼ C-13.2 Show that every language L in P is polynomial-time reducible to the language M={5}, that is, the language that simply asks if the binary encoding of the input is equal to 5.

```
Algorithm f(x):
   if A(x):
      return "101"
   else:
      return "0"
```

▼ A. Show that the MST decision problem is polynomial-time reducible to the Subset Sum problem.

```
Algorithm MST2SS(G, max)
   S ← new Sequence
   S.insertLast(1)
   if verifyMST(G, max) = YES then
      return (S,1)
   else
      return (S,2)

Algorithm verifyMST(G, max)
   edges ← MST(G)
   sum ← 0
   for each e in edges do
      sum ← sum + weight(e)

   if sum <= max then
      return YES
   else
      return NO
```

▼ B. Show the shortest path decision problem is polynomial-time reducible to the MST decision problem. Hint: convert the shortest path problem to a decision problem, then reduce to MST problem.

```
Algorithm SP2MST(G, u, v, max)
   G1 ← new Graph
   u ← G1.insertVertex(u)
   v ← G1.insertVertex(v)
   G1.insertEdge(u, v, 3)
   if verifySP(G, u, v, max) = YES then
      return (G1, 3)
   else
      return (G1, 2)
```

```
Algorithm verifySP(G, u, v, max)
    cur ← v
    while cur != u do
        e ← getParent(cur)
        sum ← weight(e)
        cur ← G.opposite(e, cur)
    if sum <= max then
        return YES
    else
        return NO
```