COMP 2247 Fall 2022 Assignment 8 Total 20 points (plus 10 points extra credit)

Choose one of two programs. 10 extra credit points if you do both.

1. Write a client program that uses **Stack** data structure to determine whether or not parentheses in a formula are balanced. The program should input a formula such as ((x + 6) * (y – 3) / (z + 8)), and then use a stack to match parentheses. It is required to use the following algorithm:

   - Each time we encounter a left parenthesis, it is pushed to the stack S.
   - Each time we encounter a closing parenthesis, the top object is popped from the stack S if the stack is not empty. If the stack is empty, the parentheses in the formula are not balanced.
   - If the stack S is empty after we have processed the entire formula, the parentheses in the formula are balanced. Otherwise, they are not balanced.

   Sample Run 1:
   ```
   Please enter the formula:  ((x+15) * (23+y))

   Balanced Parentheses!
   ```

   Sample Run 2:
   ```
   Please enter the formula: ((x+6) * (y + 2)

   Unbalanced Parentheses--more 'left' than 'right' parentheses.
   ```

   Sample Run 3:
   ```
   Please enter the formula: (x+3) * (y+2))

   Unbalanced Parentheses--fewer 'left' than 'right' parentheses.
   ```

2. Write a client program that uses **Stack** data structure to translate a postfix expression to an equivalent infix expression. It required to use the following algorithm:
   - The postfix expression is evaluated from left to right, one token at a time.
     - If an operand is encountered, it is pushed to the stack.
     - If an operator is encountered, two operands are popped, the infix expression with ( ) is constructed and the result is pushed to the stack. For example, if the operator is + and top two operands are **8** and **5**, then **(5 + 8)** is constructed and pushed to the stack.

   - In the end, the last object in the stack is the infix expression and it should be popped.

   Sample Run:
   ```
   Enter a valid postfix expression:
   5 8 + 7 9 3 - + *

   Equivalent infix expression: ((5 + 8) * (7 + (9 - 3)))
   ```

Due date: Wednesday, 11/23/22

To receive full credit, the assignment must be submitted by the due date. Late submissions will incur a penalty of 5% per day.