

Name/PID: _____

COMP520: Written Assignment 4

Q1. Sethi-Ullman Numbering.

Consider the compilation of the given expression. Show an AST for this expression and use Sethi-Ullman numbering on each node to determine the minimum number of registers needed to evaluate the expression. How many registers are needed? (Assume simple RISC instructions)

$$(x + y) * x + (x + y)$$

Q2. **Tuple code.** Show the tuple code generated by using an unlimited number of temporaries.

Q3. Common Subexpression Elimination. Describe how the tuple code in Question 2 translates to the given code? (List the steps and what changes each iteration)

```
t1 := x
t2 := y
t3 := t1 + t2
t4 := t3 * t1
t5 := t4 + t3
```

Q4. Lifetime Diagrams. Show the lifetime of each temporary t_1 - t_5 .

Q5. Interference Graphs. What is the minimum number of registers k needed to evaluate the tuple code above? Show an assignment of temporaries to k registers by constructing the the interference graph and coloring it using k colors.