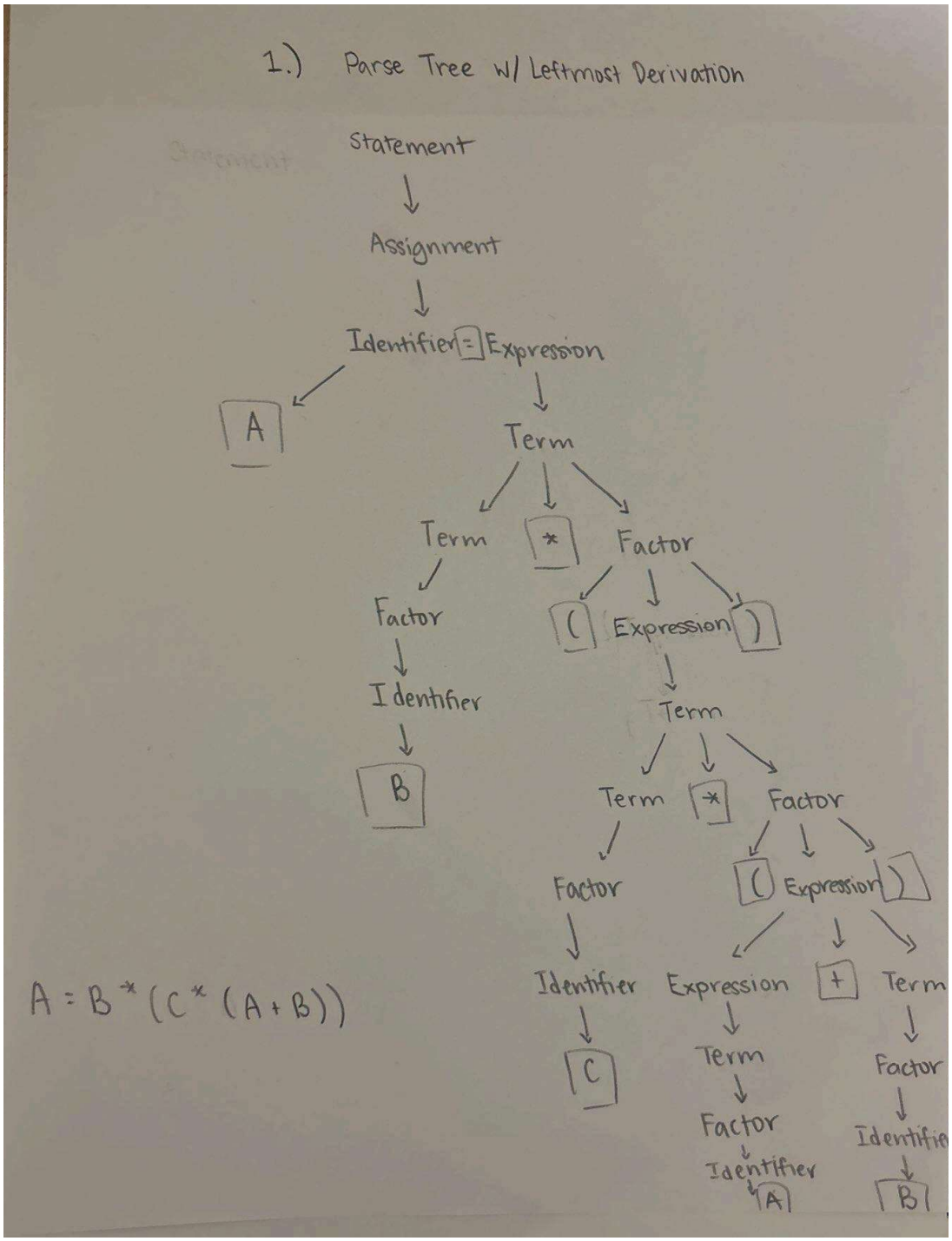
CS4080 Assignment 2

1. Parse Tree and Leftmost Derivation

A = B * (C * (A + B))

Answer:



2. Scope Concepts

a. Static Scoping

Under static scoping, nonlocal variables are not affected by other variable initializations if they are not part of the ancestry of the function called at the time. Therefore, the global variable initially assigned isn't updated.

u = 69 + 42 + 69

u = 180

add(r) **v = 69** **u = 42** **z = 69**
bar() **v = 69** **u = 42**
foo(u, 13) **v = 69** **u = 42**
main **v = 69** **u = 42** **w = 17** **x = 42**

b. Dynamic Scoping w/ Deep Binding

Under deep binding, binding is done by the environment at the time the procedure is passed as an argument. The add function is initially called at foo() and the only variable updated is v, shown by ‘v := x’.

u = 42 + 42 + 42
u = 126

add(r)
v = 42 **u = 42** **z = 42**
bar()
v = 42 **u = 42**
foo(u, 13)
v = 69 **u = 42**
main
v = 69 **u = 42** **w = 17** **x = 42**

c. Dynamic Scoping w/ Shallow Binding

With shallow binding, binding is determined by the environment at the time of the function call. In this case, we can look at the values under the stack. Statements in methods like bar() and foo() such as ‘int u := w;’ and ‘int v := x’ update the value of the variables such that u = 13 and v = 42.

u = 42 + 13 + 42

u = 97

add(r) **v = 42** **u = 13** **z = 42**
bar() **v = 42** **u = 13**
foo(u, 13) **v = 42** **u = 42** **w = 13**
main **v = 69** **u = 42** **w = 17** **x = 42**