1.

(a) I talked with Danny and he helped me to figure out question 3 part c.

(b) I acknowledge this.

2.

A close up of text on a whiteboard

Description automatically generated

3.

(a)

S -> S+S | V | N  
V -> a | b | ... | z  
N -> 0 | 1 | ... | 9

(b)

S -> N+S | V+S  
V -> a | b | ... | z  
N -> 0 | 1 | ... | 9

©

S -> S + A | A  
A -> A - B  
B -> V | N  
V -> a | b | ... | z  
N -> 0 | 1 | ... | 9

(d)

S -> S + B | S + (A) | B  
A -> A - B | B  
B -> V | N  
V -> a | b | ... | z  
N -> 0 | 1 | ... | 9

4.

(a)

A picture containing object

Description automatically generated

A close up of text on a whiteboard

Description automatically generated

(b)

<P> -> <S>

<P> -> lsp <S> rsp <S>

<P> -> lsp <S> rsp e

<P> -> lsp <S> ] e

<P> -> lsp e ] e

<P> -> [ e ] e

5.

For sum := A + B write sum

|  |  |  |
| --- | --- | --- |
| Parse stack | Input stream | Comment |
| <program> | Sum := A + B write sum $$ | <program>-><stmt\_list> $$ |
| <stmt\_list> $$ | Sum := A + B write sum $$ | <stmt\_list>-><stmt><stmt\_list> |
| <stmt><stmt\_list>$$ | Sum := A + B write sum $$ | <stmt>->id(sum):=<expr> |
| id(sum):=<expr><stmt\_list>$$ | Sum:=A+B write sum $$ | Match! Move forward |
| <expr><stmt\_list>$$ | A+B write sum $$ | <expr>-><term><term\_tail> |
| <term><term\_tail><stmt\_list>$$ | A+B write sum $$ | <term>-><factor><fact\_tail>->id(A) e  <term\_tail>-><add\_op><term><term\_tail>->+ id(B) e e |
| Id(A) + id(B) <stmt\_list> $$ | A+B write sum $$ | Match! Move forward |
| <stmt\_list> $$ | Write sum $$ | <stmt\_list>-><stmt><stmt\_list> $$ |
| <stmt><stmt\_list>$$ | Write sum $$ | <stmt>->write <expr>  <expr>-><term><term\_tail>  <term>-><factor><factor\_tail>  <factor>->id(sum)  <factor\_tail>->e |
| Write id(sum) $$ | Write sum $$ | Match! |
| $$ | $$ | done |