

## Assignment 6

① a) ((2))

$\langle \text{expr} \rangle \rightarrow \langle \text{term} \rangle$   
 $\rightarrow \langle \text{factor} \rangle$   
 $\rightarrow (\langle \text{expr} \rangle)$   
 $\rightarrow (\langle \text{term} \rangle)$   
 $\rightarrow (\langle \text{factor} \rangle)$   
 $\rightarrow ((\langle \text{expr} \rangle))$   
 $\rightarrow ((\langle \text{term} \rangle))$   
 $\rightarrow ((\langle \text{factor} \rangle))$   
 $\rightarrow ((\langle \text{number} \rangle))$   
 $\rightarrow ((\langle \text{digit} \rangle))$   
 $\rightarrow ((2))$

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$\langle \text{expr} \rangle$   
|  
 $\langle \text{term} \rangle$   
|  
 $\langle \text{factor} \rangle$   
|  
 $\langle \text{expr} \rangle$   
|  
 $\langle \text{term} \rangle$   
|  
 $\langle \text{factor} \rangle$   
|  
 $\langle \text{expr} \rangle$   
|  
 $\langle \text{term} \rangle$   
|  
 $\langle \text{factor} \rangle$   
|  
 $\langle \text{expr} \rangle$   
|  
 $\langle \text{term} \rangle$   
|  
 $\langle \text{factor} \rangle$   
|  
 $\langle \text{number} \rangle$   
|  
 $\langle \text{digit} \rangle$   
|  
 $(2)$

c)  $3 + 4 * 5 * 6 + 7$

$\langle \text{expr} \rangle \rightarrow \langle \text{expr} \rangle + \langle \text{term} \rangle$   
 $\rightarrow \langle \text{expr} \rangle + \langle \text{term} \rangle + \langle \text{term} \rangle$   
 $\rightarrow \langle \text{term} \rangle + \langle \text{term} \rangle + \langle \text{term} \rangle$   
 $\rightarrow \langle \text{term} \rangle * \langle \text{factor} \rangle + \langle \text{term} \rangle + \langle \text{term} \rangle$   
 $\rightarrow \langle \text{factor} \rangle * \langle \text{factor} \rangle + \langle \text{term} \rangle + \langle \text{term} \rangle$   
 $\rightarrow \langle \text{number} \rangle * \langle \text{factor} \rangle + \langle \text{term} \rangle + \langle \text{term} \rangle$   
 $\rightarrow \langle \text{digit} \rangle * \langle \text{factor} \rangle + \langle \text{term} \rangle + \langle \text{term} \rangle$   
 $\rightarrow 3 * \langle \text{factor} \rangle + \langle \text{term} \rangle + \langle \text{term} \rangle$   
 $\rightarrow 3 + \langle \text{number} \rangle + \langle \text{term} \rangle + \langle \text{term} \rangle$   
 $\rightarrow 3 + \langle \text{digit} \rangle + \langle \text{term} \rangle + \langle \text{term} \rangle$   
 $\rightarrow 3 + 4 + \langle \text{term} \rangle * \langle \text{factor} \rangle + \langle \text{term} \rangle$   
 $\rightarrow 3 + 4 + \langle \text{factor} \rangle$   
 $\rightarrow 3 + 4 + \langle \text{number} \rangle$   
 $\rightarrow 3 + 4 + \langle \text{digit} \rangle$   
 $\rightarrow 3 + 4 + 5$

$\Rightarrow 3 * 4 + 5 * <\text{factor}> + <\text{term}>$   
 $\Rightarrow 3 * 4 + 5 * <\text{number}> + <\text{term}>$   
 $\Rightarrow 3 * 4 + 5 * <\text{digit}> + <\text{factor}>$   
 $\Rightarrow 3 * 4 + 5 * 4 + <\text{number}>$   
 $\Rightarrow 3 * 4 + 5 * 0 + <\text{digit}>$   
 $\Rightarrow 3 * 4 + 5 * (0 + 7)$

$<\text{expr}>$

/ \

$<\text{expr}> + <\text{term}>$

$<\text{expr}> + <\text{term}>$

$<\text{factor}>$

$<\text{number}>$

$<\text{term}>$

$<\text{term}> * <\text{factor}>$

$<\text{digit}>$

$<\text{term}>$

$<\text{factor}>$

$7$

$<\text{factor}>$

$<\text{number}>$

$<\text{number}>$

$<\text{digit}>$

$<\text{number}>$

$<\text{digit}>$

$<\text{digit}>$

$0$

$<\text{digit}>$

$4$

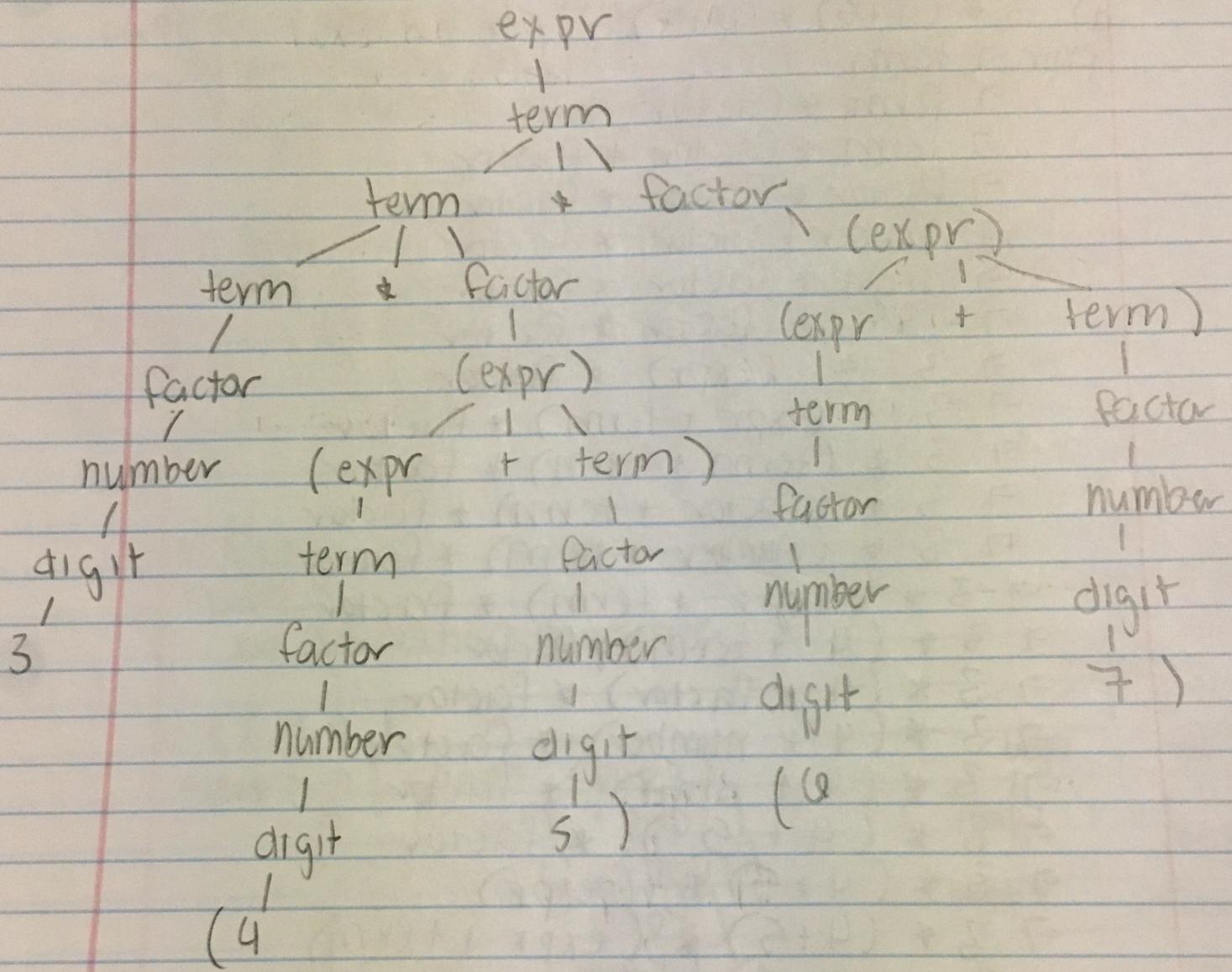
$5$

$3$

$$d) 3 + (4+5) + (0+7)$$

expr  $\rightarrow$  term

- $\rightarrow$  term \* factor
- $\rightarrow$  term \* factor \* factor
- $\rightarrow$  factor \* factor \* factor
- $\rightarrow$  number \* factor \* factor
- $\rightarrow$  digit \* factor \* factor
- $\rightarrow$  3 \* factor \* factor
- $\rightarrow$  3 \* (expr) \* factor
- $\rightarrow$  3 \* (expr + term) \* factor
- $\rightarrow$  3 \* (term + term) \* factor
- $\rightarrow$  3 \* (factor + term) \* factor
- $\rightarrow$  3 \* (number + term) \* factor
- $\rightarrow$  3 \* (digit + term) \* factor
- $\rightarrow$  3 \* (4 + term) \* factor
- $\rightarrow$  3 \* (4 + factor) \* factor
- $\rightarrow$  3 \* (4 + number) \* factor
- $\rightarrow$  3 \* (4 + digit) \* factor
- $\rightarrow$  3 \* (4 + 5) \* factor
- $\rightarrow$  3 \* (4 + 5) \* (expr)
- $\rightarrow$  3 \* (4 + 5) \* (expr + term)
- $\rightarrow$  3 \* (4 + 5) \* (term + term)
- $\rightarrow$  3 \* (4 + 5) \* (factor + term)
- $\rightarrow$  3 \* (4 + 5) \* (number + term)
- $\rightarrow$  3 \* (4 + 5) \* (digit + term)
- $\rightarrow$  3 \* (4 + 5) \* (0 + term)
- $\rightarrow$  3 \* (4 + 5) \* (0 + factor)
- $\rightarrow$  3 \* (4 + 5) \* (0 + number)
- $\rightarrow$  3 \* (4 + 5) \* (0 + digit)
- $\rightarrow$  3 \* (4 + 5) \* (0 + 7)



2 a) One or more digits between 0-9 followed optionally by an (E|e), optionally a + or - sign in front of one or more digits between 0-9.

3 a. (y)

$$\begin{aligned}
 <\text{pop}> &\rightarrow <\text{bop}> \\
 &\rightarrow (<\text{bop}>) \\
 &\rightarrow (<\text{boop}>) \\
 &\rightarrow (y)
 \end{aligned}$$

$$\begin{aligned}
 <\text{pop}> \\
 | \\
 <\text{bop}> \\
 | \\
 <\text{chop}> \\
 | \\
 <\text{boop}> \\
 | \\
 (y)
 \end{aligned}$$

b. [y]

<pop> →

no derivation possible

c. [(x), y]

$$\begin{aligned}
 <\text{pop}> &\rightarrow [<\text{bop}>, <\text{pop}>] \\
 &\rightarrow [(<\text{bop}>), <\text{pop}>] \\
 &\rightarrow [(<\text{boop}>), <\text{pop}>] \\
 &\rightarrow [(x), <\text{pop}>] \\
 &\rightarrow [(x), <\text{bop}>] \\
 &\rightarrow [(x), <\text{boop}>] \\
 &\rightarrow [(x), y]
 \end{aligned}$$

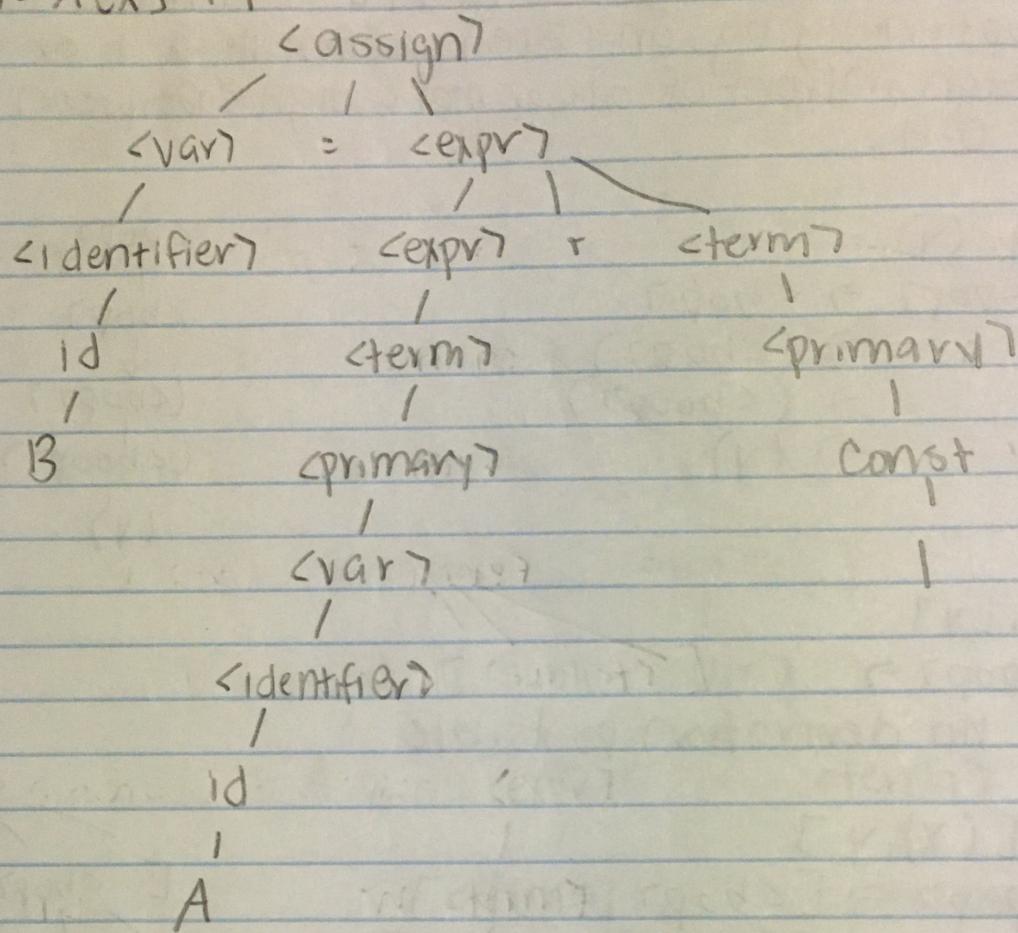
$$\begin{aligned}
 <\text{pop}> \\
 | \quad | \quad | \\
 <\text{bop}> \quad , \quad <\text{pop}> \\
 | \quad | \\
 <\text{chop}> \quad | \\
 <\text{boop}> \quad <\text{boop}> \\
 | \quad | \\
 x \quad y
 \end{aligned}$$

d. [(x), [z, x], ([z])]

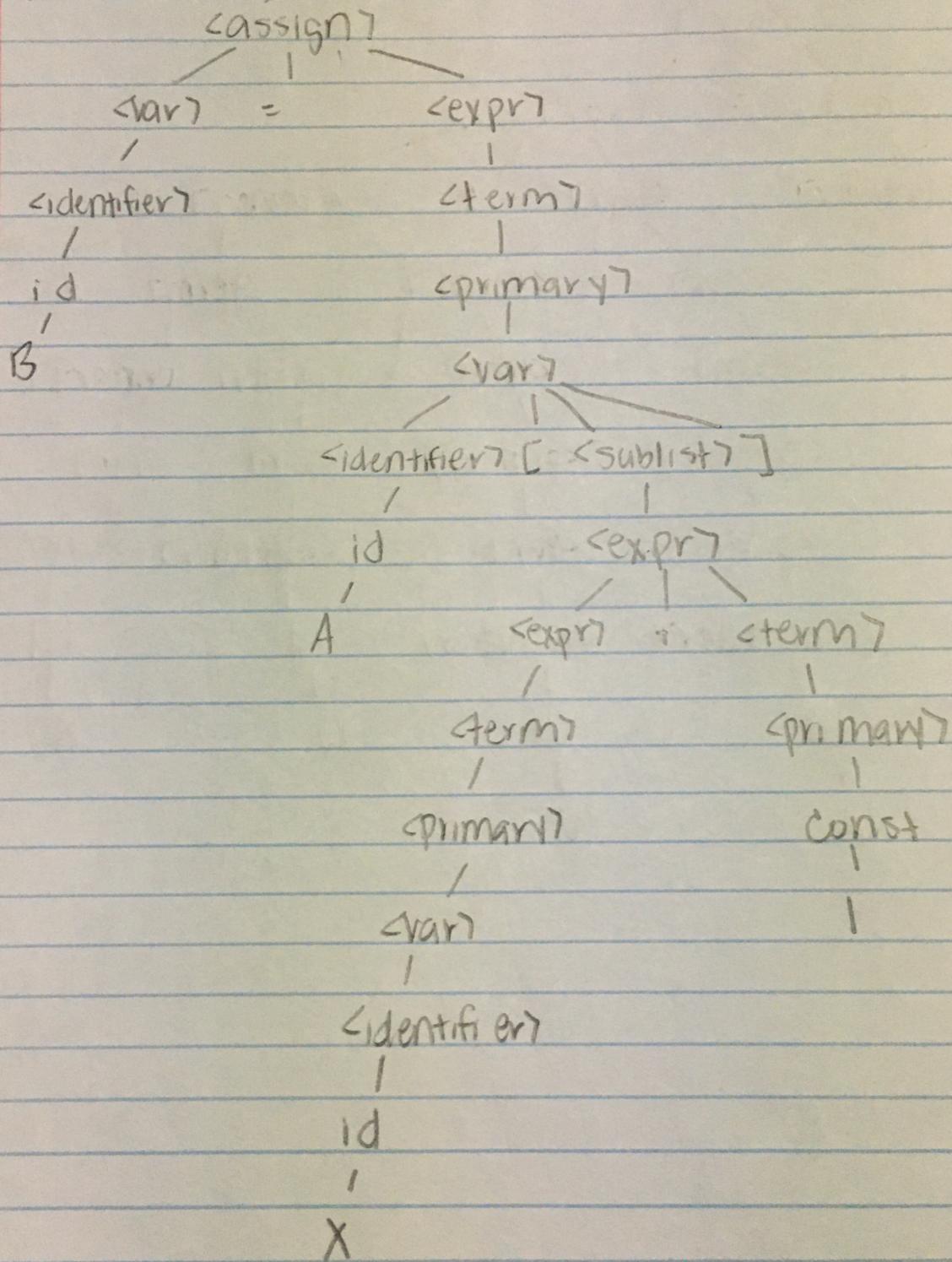
not possible

$$\begin{aligned}
 <\text{pop}> &\rightarrow [<\text{bop}>, <\text{pop}>] \\
 &\rightarrow [(<\text{bop}>), <\text{pop}>] \\
 &\rightarrow [(<\text{boop}>), <\text{pop}>] \\
 &\rightarrow [(x), <\text{pop}>] \\
 &\rightarrow [(x), [<\text{bop}>, <\text{pop}>]] \\
 &\rightarrow [(x),
 \end{aligned}$$

4 a)  $B = A[x] + 1$



b)  $B = AC[x+1]$



c)  $x = u - v + w + x/y$

