2.1

S → (L) | a
L → L-S | S

(1) S → (L)

(2) S → a

(3) L → SL'

(4) L' → -SL'

(5) L' → ε

	FIRST	***FOLLOW***
S	(, a	$, -,)
L	(, a	)
L'	-, ε	)

	a	***(***	***)***	**-**	***$***
S	S → a (2)	S → (L) (1)			
L	L → SL' (3)	L → SL' (3)			
L'			L' → ε (5)	L' → -SL' (4)	

#S	(a-a-a)$	ε
#)L(	(a-a-a)$	1
#)L	a-a-a)$	1
#)L'S	a-a-a)$	13
#)L'a	a-a-a)$	132
#)L'	-a-a)$	132
#)L'S-	-a-a)$	1324
#)L'S	a-a)$	1324
#)L'a	a-a)$	13242

#)L'	-a)$	13242
#)L'S-	-a)$	132424
#)L'S	a)$	132424
#)L'a	a)$	1324242
#)L'	)$	1324242
#)	)$	13242425
#	$	13242425

2.2

S → (L) | a
L → S-L | S

(1) S → a
(2) S → (L)
(3) L → SL'
(4) L' → -L
(5) L' → ε

	FIRST	***FOLLOW***
S	a, (	$, -,)
L	a, (	)
L'	-, ε	)

	a	***(***	***)***	**-**	***$***
S	S → a (1)	S → (L) (2)			
L	L → SL' (3)	L → SL' (3)			
L'			L' → ε (5)	L' → -L (4)	

#S	((a)-a)$	ε

#)L(	((a)-a)$	2
#)L	(a)-a)$	2
#)L'S	(a)-a)$	23
#)L')L(	(a)-a)$	232
#)L')L	a)-a)$	232
#)L')L'S	a)-a)$	2323
#)L')L'a	a)-a)$	23231
#)L')L'	)-a)$	23231
#)L')	)-a)$	232315
#)L'	-a)$	232315
#)L-	-a)$	2323154
#)L	a)$	2323154
#)L'S	a)$	23231543
#)L'a	a)$	232315431
#)L'	)$	232315431
#)	)$	2323154315
#	$	2323154315

2.3

S → -S | L
L → a(S) | a

(1) S → -S

(2) S → L

(3) L → aL'

(4) L' → (S)

(5) L' → ε

	FIRST	***FOLLOW***
S	-, a	$,)

	FIRST	***FOLLOW***
L	a	$,)
L'	(, ε	$,)

	a	***(***	***)***	***-***	***$***
S	S → L (2)			S → -S (1)	
L	L → aL' (3)				
L'		L' → (S) (4)	L' → ε (5)		L' → ε (5)

#S	-a(-a)$	ε
#S-	-a(-a)$	1
#S	a(-a)$	1
#L	a(-a)$	12
#L'a	a(-a)$	123
#L'	(-a)$	123
#)S(	(-a)$	1234
#)S	-a)$	1234
#)S-	-a)$	12341
#)S	a)$	12341
#)L	a)$	123412
#)L'a	a)$	1234123
#)L'	)$	1234123
#)	)$	12341235
#	$	12341235

2.4

S → S* | L
L → a(S) | a

(1) $S \rightarrow LS'$

(2) $S' \rightarrow *S'$

(3) $S' \rightarrow \varepsilon$

(4) $L \rightarrow aL'$

(5) $L' \rightarrow (S)$

(6) $L' \rightarrow \varepsilon$

	FIRST	***FOLLOW***
S	a	$,)
S'	*, ε	$,)
L	a	*, $,)
L'	(, ε	*, $,)

	a	***(***	***)***	*******	***$***
S	S → LS' (1)				
S'			S' → ε (3)	S' → *S' (2)	S' → ε (3)
L	L → aL' (4)				
L'		L' → (S) (5)	L' → ε (6)	L' → ε (6)	L' → ε (6)

#S	a(a*)*$	ε
#S'L	a(a*)*$	1
#S'L'a	a(a*)*$	14
#S'L'	(a*)*$	14
#S')S(	(a*)*$	145
#S')S	a*)*$	145
#S')S'L	a*)*$	1451
#S')S'L'a	a*)*$	14514

#S')S'L'	*)*$	14514
#S')S'	*)*$	145146
#S')S'*	*)*$	1451462
#S')S'	)*$	1451462
#S')	)*$	14514623
#S'	*$	14514623
#S'*	*$	145146232
#S'	$	145146232
#	$	1451462323

2.5

S → (S) | L
L → a(S) | a

(1) S → (S)

(2) S → L

(3) L → aL'

(4) L' → (S)

(5) L' → ε

	FIRST	***FOLLOW***
S	(, a	$,)
L	a	$,)
L'	(, ε	$,)

	a	***(***	***)***	***$***
S	S → L (2)	S → (S) (1)		
L	L → aL' (3)			

	a	***(***	***)***	***$***
L'		L' → (S) (4)	L' → ε (5)	L' → ε (5)

#S	(a(a)$	ε
#)S(	(a(a)$	1
#)S	a(a)$	1
#)L	a(a)$	12
#)L'a	a(a)$	123
#)L'	(a)$	123
#))S(	(a)$	1234
#))S	a)$	1234
#))L	a)$	12342
#))L'a	a)$	123423
#))L'	)$	123423
#))	)$	1234235
#)	$	1234235

słowo wejściowe jest niepoprawne, brakuje na końcu ')'

2.6

E → E+V | V
V → V*F | F
F → a | a(E) | (E) | F^

(1) E → VE'

(2) E' → +VE'

(3) E' → ε

(4) V → FV'

(5) V' → *FV'

(6) V' → ε

(7) F → (E)F'

(8) F → aF"

(9) F" → F'

(A)F" → (E)F'

(B)F' → ^F'

(C)F' → ε

	FIRST	***FOLLOW***
E	(, a	$,)
E'	+, ε	$,)
V	(, a	+, $,)
V'	*, ε	+, $,)
F	(, a	*, +, $,)
F'	^, ε	*, +, $,)
F"	(, ^, ε	*, +, $,)

	a	***(***	***)***	**+**	*****	^	***$***
E	E → VE' (1)	E → VE' (1)					
E'			E' → ε (3)	E' → +VE' (2)			E' → ε (3)
V	V → FV' (4)	V → FV' (4)					
V'			V' → ε (6)	V' → ε (6)	V' → *FV' (5)		V' → ε (6)
F	F → aF" (8)	F → (E)F' (7)					
F'			F' → ε (C)	F' → ε (C)	F' → ε (C)	F' → ^F' (B)	F' → ε (C)
F''		F" → (E)F' (A)	F" → F' (9)	F" → F' (9)	F" → F' (9)	F" → F' (9)	F" → F' (9)

#E	(a+a(a^)*a)+a$	ε

#E'V	(a+a(a^)*a)+a$	1
#E'V'F	(a+a(a^)*a)+a$	14
#E'V'F')E(	(a+a(a^)*a)+a$	147
#E'V'F')E	a+a(a^)*a)+a$	147
#E'V'F')E'V	a+a(a^)*a)+a$	1471
#E'V'F')E'V'F	a+a(a^)*a)+a$	14714
#E'V'F')E'V'F"a	a+a(a^)*a)+a$	147148
#E'V'F')E'V'F"	+a(a^)*a)+a$	147148
#E'V'F')E'V'F'	+a(a^)*a)+a$	1471489
#E'V'F')E'V'	+a(a^)*a)+a$	1471489C
#E'V'F')E'	+a(a^)*a)+a$	1471489C6
#E'V'F')E'V+	+a(a^)*a)+a$	1471489C62
#E'V'F')E'V	a(a^)*a)+a$	1471489C62
#E'V'F')E'V'F	a(a^)*a)+a$	1471489C624
#E'V'F')E'V'F"a	a(a^)*a)+a$	1471489C6248
#E'V'F')E'V'F"	(a^)*a)+a$	1471489C6248
#E'V'F')E'V'F')E(	(a^)*a)+a$	1471489C6248A
#E'V'F')E'V'F')E	a^)*a)+a$	1471489C6248A
#E'V'F')E'V'F')E'V	a^)*a)+a$	1471489C6248A1
#E'V'F')E'V'F')E'V'F	a^)*a)+a$	1471489C6248A14
#E'V'F')E'V'F')E'V'F"a	a^)*a)+a$	1471489C6248A148
#E'V'F')E'V'F')E'V'F"	^)*a)+a$	1471489C6248A148
#E'V'F')E'V'F')E'V'F'	^)*a)+a$	1471489C6248A1489
#E'V'F')E'V'F')E'V'F'^	^)*a)+a$	1471489C6248A1489B
#E'V'F')E'V'F')E'V'F'	)*a)+a$	1471489C6248A1489B
#E'V'F')E'V'F')E'V'	)*a)+a$	1471489C6248A1489BC
#E'V'F')E'V'F')E'	)*a)+a$	1471489C6248A1489BC6
#E'V'F')E'V'F')	)*a)+a$	1471489C6248A1489BC63
#E'V'F')E'V'F'	*a)+a$	1471489C6248A1489BC63

#E'V'F')E'V'	*a)+a$	1471489C6248A1489BC63C
#E'V'F')E'V'F*	*a)+a$	1471489C6248A1489BC63C5
#E'V'F')E'V'F	a)+a$	1471489C6248A1489BC63C5
#E'V'F')E'V'F"a	a)+a$	1471489C6248A1489BC63C58
#E'V'F')E'V'F"	)+a$	1471489C6248A1489BC63C58
#E'V'F')E'V'F'	)+a$	1471489C6248A1489BC63C589
#E'V'F')E'V'	)+a$	1471489C6248A1489BC63C589C
#E'V'F')E'	)+a$	1471489C6248A1489BC63C589C6
#E'V'F')	)+a$	1471489C6248A1489BC63C589C63
#E'V'F'	+a$	1471489C6248A1489BC63C589C63
#E'V'	+a$	1471489C6248A1489BC63C589C63C
#E'	+a$	1471489C6248A1489BC63C589C63C6
#E'V+	+a$	1471489C6248A1489BC63C589C63C62
#E'V	a$	1471489C6248A1489BC63C589C63C62
#E'V'F	a$	1471489C6248A1489BC63C589C63C624
#E'V'F"a	a$	1471489C6248A1489BC63C589C63C6248
#E'V'F"	$	1471489C6248A1489BC63C589C63C6248
#E'V'F'	$	1471489C6248A1489BC63C589C63C62489
#E'V'	$	1471489C6248A1489BC63C589C63C62489C
#E'	$	1471489C6248A1489BC63C589C63C62489C6
#	$	1471489C6248A1489BC63C589C63C62489C63

2.7

$E \rightarrow E+V \mid V$
$V \rightarrow -V \mid F$
$F \rightarrow a \mid a(E) \mid (E) \mid F*$

(1) $E \rightarrow VE'$

(2) $E' \rightarrow +VE'$

(3) $E' \rightarrow \varepsilon$

(4) $V \rightarrow -V$

(5) $V \rightarrow F$

(6) $F' \rightarrow (E)$

(7) $F' \rightarrow \varepsilon$

(8) $F \rightarrow aF'F''$

(9) $F \rightarrow (E)F''$

(A)$F'' \rightarrow *F''$

(B)$F' \rightarrow \varepsilon$

	FIRST	***FOLLOW***
E	(, a, -	$,)
E'	ε, +	$,)
V	(, a, -	+, $,)
F	(, a	+, $,)
F'	ε, (	*, +, $,)
F''	ε, *	+, $,)

	a	***(***	***)***	**-**	**+**	*****	***$***
E	E → VE' (1)	E → VE' (1)		E → VE' (1)			
E'			E' → ε (3)		E' → +VE' (2)		E' → ε (3)
V	V → F (5)	V → F (5)		V → -V (4)			
F	F → aF'F'' (8)	F → (E)F'' (9)					
F'		F' → (E) (6)	F' → ε (7)		F' → ε (7)	F' → ε (7)	F' → ε (7)
F''			F' → ε (B)		F' → ε (B)	F'' → *F'' (A)	F' → ε (B)

#E	(-a+a(a*))+a$	ε

#E'V	(-a+a(a*))+a$	1
#E'F	(-a+a(a*))+a$	15
#E'F")E(	(-a+a(a*))+a$	159
#E'F")E	-a+a(a*))+a$	159
#E'F")E'V	-a+a(a*))+a$	1591
#E'F")E'V-	-a+a(a*))+a$	15914
#E'F")E'V	a+a(a*))+a$	15914
#E'F")E'F	a+a(a*))+a$	159145
#E'F")E'F"F'a	a+a(a*))+a$	1591458
#E'F")E'F"F'	+a(a*))+a$	1591458
#E'F")E'F"	+a(a*))+a$	15914587
#E'F")E'	+a(a*))+a$	15914587B
#E'F")E'V+	+a(a*))+a$	15914587B2
#E'F")E'V	a(a*))+a$	15914587B2
#E'F")E'F	a(a*))+a$	15914587B25
#E'F")E'F"F'a	a(a*))+a$	15914587B258
#E'F")E'F"F'	(a*))+a$	15914587B258
#E'F")E'F")E(	(a*))+a$	15914587B2586
#E'F")E'F")E	a*))+a$	15914587B2586
#E'F")E'F")E'V	a*))+a$	15914587B25861
#E'F")E'F")E'F	a*))+a$	15914587B258615
#E'F")E'F")E'F"F'a	a*))+a$	15914587B2586158
#E'F")E'F")E'F"F'	*))+a$	15914587B2586158
#E'F")E'F")E'F"	*))+a$	15914587B25861587
#E'F")E'F")E'F"*	*))+a$	15914587B25861587A
#E'F")E'F")E'F"	))+a$	15914587B25861587A
#E'F")E'F")E'	))+a$	15914587B25861587AB
#E'F")E'F")	))+a$	15914587B25861587AB3
#E'F")E'F"	)+a$	15914587B25861587AB3

#E'F")E'	)+a$	15914587B25861587AB3B
#E'F")	)+a$	15914587B25861587AB3B3
#E'F"	+a$	15914587B25861587AB3B3
#E'	+a$	15914587B25861587AB3B3B
#E'V+	+a$	15914587B25861587AB3B3B2
#E'V	a$	15914587B25861587AB3B3B2
#E'F	a$	15914587B25861587AB3B3B25
#E'F"F'a	a$	15914587B25861587AB3B3B258
#E'F"F'	$	15914587B25861587AB3B3B258
#E'F"	$	15914587B25861587AB3B3B2587
#E'	$	15914587B25861587AB3B3B2587B
#	$	15914587B25861587AB3B3B2587B3

2.8

S → L=E
L → a | a(E)
E → E+V | V
V → a | a(E) | (E)

(1) S → L=E

(2) L → aL'

(3) L' → ε

(4) L' → (E)

(5) E → VE'

(6) E' → +VE'

(7) E' → ε

(8) V → (E)

(9) V → aV'

(A)V' → ε

(B)V' → (E)

	FIRST	***FOLLOW***
S	a	$,
L	a	=
L'	(, ε	=
E	a, (	), $
E'	ε, +	), $
V	a, (	+,), $
V'	(, ε	+,), $

	a	***(***	***)***	+	=	***$***
S	S → L=E (1)					
L	L → aL' (2)					
L'		L' → (E) (4)			L' → ε (3)	
E	E → VE' (5)	E → VE' (5)				
E'			E' → ε (7)	E' → +VE' (6)		E' → ε (7)
V	V → aV' (9)	V → (E) (8)				
V'		V' → (E) (B)	V' → ε (A)	V' → ε (A)		V' → ε (A)

#S	a(a+a)=a+a(a)$	ε
#E=L	a(a+a)=a+a(a)$	1
#E=L'a	a(a+a)=a+a(a)$	12
#E=L'	(a+a)=a+a(a)$	12
#E=)E(	(a+a)=a+a(a)$	124
#E=)E	a+a)=a+a(a)$	124
#E=)E'V	a+a)=a+a(a)$	1245

#E=)E'V'a	a+a)=a+a(a)$	12459
#E=)E'V'	+a)=a+a(a)$	12459
#E=)E'	+a)=a+a(a)$	12459A
#E=)E'V+	+a)=a+a(a)$	12459A6
#E=)E'V	a)=a+a(a)$	12459A6
#E=)E'V'a	a)=a+a(a)$	12459A69
#E=)E'V'	)=a+a(a)$	12459A69
#E=)E'V'	)=a+a(a)$	12459A69
#E=)E'	)=a+a(a)$	12459A69A
#E=)	)=a+a(a)$	12459A69A7
#E=	=a+a(a)$	12459A69A7
#E	a+a(a)$	12459A69A7
#E'V	a+a(a)$	12459A69A75
#E'V'a	a+a(a)$	12459A69A759
#E'V'	+a(a)$	12459A69A759
#E'	+a(a)$	12459A69A759A
#E'V+	+a(a)$	12459A69A759A6
#E'V	a(a)$	12459A69A759A6
#E'V'a	a(a)$	12459A69A759A69
#E'V'	(a)$	12459A69A759A69
#E')E(	(a)$	12459A69A759A69B
#E')E	a)$	12459A69A759A69B
#E')E'V	a)$	12459A69A759A69B5
#E')E'V'a	a)$	12459A69A759A69B59
#E')E'V'	)$	12459A69A759A69B59
#E')E'	)$	12459A69A759A69B59A
#E')	)$	12459A69A759A69B59A7
#E'	$	12459A69A759A69B59A7
#	$	12459A69A759A69B59A77