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1.

1. f(x) = x+1, x>0

    $| → 1$

    $# → |

    $|||# → |$||# → ||$|# → |||$# → ||||

2. f(x) = 3*x, x>0

    $|→|||$

    $# → ε

    $|||# → |||$||# → ||||||$|# ->|||||||||$# →|||||||||

3. f(x,y) = x-y, x>0,y>0, and x>y

    |&| → &

    &# → ε

    $| → |

    $|||&||# → $||&|# → $|&# → $| → |

2.

1) Rule 1 (0+0) → 0

    Rule 2 (0+1) → 1

    Rule 3 (1+0) → 1

    Rule 4 (0+2) → 2

    Rule 5 (2+0) → 2

    Rule 6 (1+1) → 2

    Rule 7 (1+2) → 0

    Rule 8 (2+1) → 0

    Rule 9 (2+2) → 1

2) ((<u>1+2</u>)+0) →rule 7→ (0+0) →rule 1→ 0

(<u>1+(2</u>+2)) →rule 9→ (1+1) →rule 6→ 2

3) NO, it is not always unique because in ((1+2)+(0+1)), we can do rule 7 or rule 2 to rewrite the expression .

3.

1) All strings over the alphabet {0,1}, and also ε.

2) All strings over the alphabet {0,1} that have the property starts with 0 and ends with 101 or 111.

4.

a*(((b|ε)a*(c|ε)a*(c|ε) a*(c|ε))

|((c|ε)a*(b|ε)a*(c|ε)a*(c|ε))

|((c|ε)a*(c|ε) a*(b|ε)a*(c|ε))

|(c|ε)a*(c|ε) a*(c|ε)a*(b|ε)))a*

5.

1)

(0|(1|2|3|4|5|6|7|8|9)(0|1|2|3|4|5|6|7|8|9)*)

.(0|(0|1|2|3|4|5|6|7|8|9)*(1|2|3|4|5|6|7|8|9))

2)