

$$F(e, T) = \{X \cup \{e\} \mid X \in T\}$$

If  $S = \{\}$ , then  $P(S) = \{\{\}\}$

Else:

Let  $e$  be single element of  $S$   
let  $T = S \setminus \{e\}$

$$P(S) = P(T) \cup F(e, P(T))$$

recursion  
goes  
down

iteration  
goes  
this way

$$S = \{1, 2, 3\}$$

1.

$$e = 1$$

$$T = 2, 3$$

$$P(S) = P(\{2, 3\}) \cup F(1, P(\{2, 3\}))$$

$$\left[ (\emptyset \cup 2 \cup 2, 3) \right] \cup \left[ 1 \cup (\emptyset \cup 2 \cup 2, 3) \right]$$

$\downarrow$   
 $1 \cup$

$$P(\{2, 3\})$$

$$e = 2$$

$$P(\{2, 3\}) = P(\{3\}) \cup F(2, P(\{3\}))$$

$$T = 3$$

$$\emptyset \cup 3 \cup \{2\} \cup \{\emptyset\}, \{3\}$$

$$\emptyset \cup 3 \cup 2 \cup 2, 3$$

$$P(\{3\})$$

$$e = 3$$

$$T = \emptyset$$

$$P(\{3\}) = \{\emptyset\} \cup F(3, \emptyset)$$

$$\emptyset \cup 3$$

start  
by  
union  
of empty & list element

Illustration

3 2 1  
S {x, y, z}

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powerSet = { }

add empty

for every item in S

temp = item

$\{ \{ \emptyset \} \} \rightarrow \{ \{ \emptyset \}, \{ z \} \}$   
 ~~$\{ \{ \emptyset \}, \{ z \} \}$~~

2  ~~$\{ \{ \emptyset \}, \{ z \} \}$~~

$\{ \{ \emptyset \}, \{ z \}, \{ x \}, \{ x, z \} \}$

1  $\{ \{ \emptyset \}, \{ x \}, \{ z \}, \{ x, z \}, \{ y \}, \{ x, y \}, \{ y, z \}, \{ x, y, z \} \}$

$S$   
 $PS = \{\epsilon\}$   
 for  $e \in S$

Final Form?

-  $PS' = \{\epsilon\}$

- For  $s \in PS$

-  $PS' \not\leftarrow s$

-  $ns \leftarrow s \cup \epsilon$

-  $PS' \leftarrow ns$

-  $PS = PS'$

~~$PS$   
 $PS'$   
 $PS = PS'$~~