

1) 2) - 4) פונקציה ממשלתית

$$hw = \text{otp}(\{0, \dots, n-1\} \times w) \quad 1$$

$w \rightarrow \{0, \dots, n-1\} \times w \rightarrow \text{צורה של } w$

$$f(k, h) \leftrightarrow n \cdot m + k$$

$$h = n \cdot m + h \quad \text{על ידי } f \text{ קודם } \rightarrow \text{צורה}$$

אם  $f$  היא פונקציה ממשלתית  $(0 \leq k < m, 0 \leq h < n)$   $k < n$  ואם  $(k, h) \in \mathbb{N}^2$

$$(k_1, h_1) < (k_2, h_2) \quad \text{אם } k_1 < k_2 \text{ או } k_1 = k_2 \text{ ו- } h_1 < h_2$$

$$h_1 + k_1 < h_2 + k_2 \quad \text{אם } k_1 < k_2 \text{ או } k_1 = k_2 \text{ ו- } h_1 < h_2 \quad \text{אם } k_1 < k_2 \text{ או } k_1 = k_2 \text{ ו- } h_1 < h_2$$

$$m + h_1 \geq 1 \quad \text{אם } k_1 < k_2 \text{ או } k_1 = k_2 \text{ ו- } h_1 < h_2 \quad \text{אם } k_1 < k_2 \text{ או } k_1 = k_2 \text{ ו- } h_1 < h_2$$

$\Downarrow$

$$n(h_2 - h_1) \geq n > k_2 - k_1$$

$$\Downarrow \quad 0 \leq k_1, k_2 \leq n-1$$

$$f \text{ קודם} \quad nm_2 + h_2 > nm_1 + h_1$$

$$f(\beta + \gamma) = \text{otp}(f \times (\text{otp}(\beta + \gamma))) \quad 2$$

$$f\beta + f\gamma = \text{otp}(f\beta \cup f\gamma) =$$

$$\text{otp}(\text{otp}(f\beta) \cup \text{otp}(f\gamma))$$

$$f: f\beta + f\gamma \rightarrow f\beta + f\gamma \quad \text{אם } f\beta + f\gamma \rightarrow f\beta + f\gamma$$

$$f: f\beta + f\gamma \rightarrow f\beta \cup f\gamma \quad \text{אם } f\beta + f\gamma \rightarrow f\beta \cup f\gamma$$

$$g: f\beta \rightarrow f\beta$$

$$h: f\gamma \rightarrow f\gamma$$

$$x \in f\beta, y \in f\gamma \quad f(x, y) = (x, f(y)) \quad \text{אם } f\beta + f\gamma \rightarrow f\beta \cup f\gamma$$

$$f(y) = \text{otp}(f\beta \cup f\gamma)$$

$$f(f\beta + f\gamma) \rightarrow f(f\beta \cup f\gamma) \quad \text{אם } f\beta + f\gamma \rightarrow f\beta \cup f\gamma$$

$$f\beta \cup f\gamma \rightarrow f\beta \cup f\gamma \quad \text{אם } f\beta + f\gamma \rightarrow f\beta \cup f\gamma$$

$$f\beta \cup f\gamma \rightarrow f\beta \cup f\gamma \quad \text{אם } f\beta + f\gamma \rightarrow f\beta \cup f\gamma$$

$$f\beta + f\gamma \rightarrow f\beta \cup f\gamma \quad \text{אם } f\beta + f\gamma \rightarrow f\beta \cup f\gamma$$

$$\beta = \sup_{x \in P} \alpha(x) \quad \text{if } \alpha \in P \quad \text{if } \alpha \in P \Rightarrow 3$$

~~if~~

$$\alpha^\beta = \alpha \sup_{x \in P} \alpha = \sup_{x \in P} \alpha \alpha$$

problem in previous is that  $\alpha \gamma < \alpha \beta \iff \gamma < \beta$

! that  $\alpha^\beta$  is not necessarily prime

$$\beta = \beta + 1 \quad \text{if } \alpha \in P \quad \text{if } \alpha \in P$$

$$\alpha^{(\beta+1)} = \alpha^{\beta+1}$$

! that  $\alpha^\beta$  is not necessarily prime

$$\alpha = \alpha^{\beta+1} \quad \text{if } \alpha \in P \quad \text{if } \alpha \in P \iff$$

$$(\alpha^{\beta+1})^{\beta+1} = (\alpha^{\beta+1})^{\beta+1}$$

! that  $\alpha^\beta$  is not necessarily prime

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$$\alpha^{\beta+1} = \alpha^{\beta+1}$$

! that  $\alpha^\beta$  is not necessarily prime

$$(\alpha^{\beta+1})^{\beta+1} = \alpha^{\beta+1}$$

! that  $\alpha^\beta$  is not necessarily prime

$$\alpha^{(\beta+1)} = \alpha^{\beta+1} = \alpha^{\beta+1} \cdot \alpha = (\alpha^{\beta+1})^{\beta+1} \cdot \alpha$$

! that  $\alpha^\beta$  is not necessarily prime

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$$(\alpha^{\beta+1})^{\beta+1}$$

! that  $\alpha^\beta$  is not necessarily prime

$$\alpha^{\beta+1} = \alpha^{\beta+1} = \alpha^{\beta+1} = \sup \alpha^{\beta+1} = \sup (\alpha^{\beta+1}) =$$

! that  $\alpha^\beta$  is not necessarily prime

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$$(\alpha^{\beta+1})^{\beta+1} = (\alpha^{\beta+1})^{\beta+1}$$

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א ב סדרות נורמליות

ב-1 לראות שהסדרות נורמליות

$$x^{n+1} = x^n \cdot x > x^n$$

א-1 סדרות נורמליות

$$x^{n+1} = x^n \cdot x > x^n > x^p$$

לכן  $\beta < \delta < \alpha$  וכן  $\beta < \alpha$  וכן  $\beta < \alpha$

$$x^\alpha = x^{\sup \alpha} = \sup_{\delta < \alpha} x^\delta$$

$\beta < \delta < \alpha$  וכן  $\alpha, \beta < \alpha$  וכן  $\beta < \alpha$

$$x^\delta > x^\beta$$

$$x^\alpha = \sup_{\delta < \alpha} x^\delta \geq x^\delta > x^\beta$$

$\alpha = 3, \beta = 2$  ~~לכן~~ וכן  $\beta < \alpha$

$$2^w = w$$

$$3^w = w$$