

1. naloga: katere tipe imajo navedeni programi?

$$p_1 = \{ x=3, f = \text{fun } f (n:\text{int}) : \text{int} \text{ is } 7 \}. f$$

$$p_2 = \{ x=3, f' = \text{fun } f (u:\{\}) : \text{int} \text{ is } 7 \}$$

$$p_3 = \{ x=3, f = \text{fun } f (t: \{a:\text{int}, b:\text{int}\}) : \text{int} \text{ is } t.a \cdot t.b \}$$

$$\tau_1 = \{\}$$

$$\tau_2 = \{ x:\text{int}, f:\{\} \rightarrow \text{int} \}$$

$$\tau_3 = \{ f:\{a:\text{int}\} \rightarrow \text{int} \}$$

$$p_1: \text{int} \rightarrow \text{int}$$

$$p_2: \{ x:\text{int}, f:\{\} \rightarrow \text{int} \} = \tau_2 \leq \tau_3 \leq \tau_1$$

$$p_3: \{ x:\text{int}, f:\{a:\text{int}, b:\text{int}\} \rightarrow \text{int} \} \leq \tau_1$$

2. naloga: katere tipe imajo navedeni programi?

$$\begin{aligned}
 p_1 &= \left(\{x=3, f = \text{fun } f(m: \text{int}) : \{\} \text{ is } \{\}\} \right) 42 : \{\} = \tau_1 \\
 p_2 &= \{x=3, f = \text{fun } f(m: \text{int}) : \{\} \text{ is } \{\}\} : \{x: \text{int}, f: \text{int} \rightarrow \{\}\} = \tau_2 \subseteq \tau_1 \\
 p_3 &= \{x=3, f = \text{fun } f(m: \text{int}) : \{a: \text{int}\} \text{ is } \{a=m, b=m+1\}\} : \{x: \text{int}, f: \text{int} \rightarrow \{a: \text{int}\}\} \\
 &= \tau_3 \subseteq \tau_2 \subseteq \tau_1
 \end{aligned}$$

$$\tau_1 = \{\}$$

$$\tau_2 = \{x: \text{int}, f: \text{int} \rightarrow \{\}\}$$

$$\tau_3 = \{f: \text{int} \rightarrow \{a: \text{int}\}\}$$

3. naloga: katere tipe imajo navedeni programi?

$$\mu_1 = \{x = \{y = \{x = 3\}\}\}. X$$

$$\mu_2 = \{x = \{y = 3\}, f = \text{fun } g(a: \{n: \text{int}\}) : \text{int} \text{ is } a.n + 3\}$$

$$\mu_3 = \{y = \{x = 3\}, f = \text{fun } f(a: \{\}) : \text{int} \text{ is } f a\}$$

$$\tau_1 = \{y: \{\}\}$$

$$\mu_1: \{y: \{x: \text{int}\}\} \leq \tau_1$$

$$\tau_2 = \{x: \{y: \text{int}\}\}$$

$$\mu_2: \{x: \{y: \text{int}\}, f: \{n: \text{int}\} \rightarrow \text{int}\} \leq \tau_2$$

$$\tau_3 = \{f: \{a: \{\}\} \rightarrow \text{int}, y: \{x: \text{int}\}\}$$

$$\mu_3: \{y: \{x: \text{int}\}, f: \{\} \rightarrow \text{int}\} \leq \tau_3 \leq \tau_1$$

4. naloga: kateri od sledečih tipov so podtipi katerega drugega tipa?

a) objekt = {}

b) point = { x: int, y: int }

c) color = { r: int, g: int, b: int }

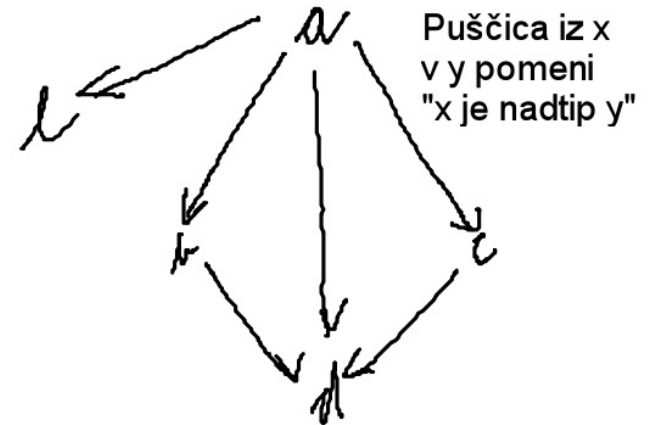
d) spoint = { x: int, y: int, r: int, g: int, b: int }

e) spoint[] = { p: point, c: color }

f) spoint → { x: int }

g) point → objekt

h) point → spoint



5. naloga: katere tipe imajo navedeni programi?

$P_1 = \{x=10, f = \text{funkc. } (p: \{b: \text{bool}, m: \text{int}\}) : \text{bool} \mid p.m = 1\}$

$P_2 = \{x=2, f = \text{funkc. } (p: \{m: \text{int}\}) : \text{bool} \mid p.m = 3\}$

$P_3 = \{y=5, f = \text{funkc. } (p: \{m: \text{int}\}) : \text{bool} \mid p.m = 5\}$

$T_1 = \{x: \text{int}, f: \{b: \text{bool}, m: \text{int}\} \rightarrow \text{bool}\}$

$T_2 = \{f: \{m: \text{int}\} \rightarrow \text{bool}\}$

$T_3 = \{x: \text{int}, f: \{m: \text{int}\} \rightarrow \text{bool}\}$

$P_1: \{x: \text{int}, f: \{b: \text{bool}, m: \text{int}\} \rightarrow \text{bool}\} = T_1$

$P_2: \{x: \text{int}, f: \{m: \text{int}\} \rightarrow \text{bool}\} = T_3 \leq T_2, T_1$

$P_3: \{y: \text{int}, f: \{m: \text{int}\} \rightarrow \text{bool}\} \leq T_2$