Principles of Programming Languages - Homework 4

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1 Problem 1

(i) $e_1 = x + 2$

(a) $\overline{x_1} + 2$
(b) $fv(e) = \{x_1\}$
(c) $\langle\ \underline{3},\ \langle \underline{2},\ x\rangle,\ \langle \underline{1}\rangle,\ \langle\ \underline{1},\ \langle 2\rangle\ \rangle\ \rangle$

(ii) $e_2 = const\ x = 2;\ x * y$

(a) $const\ \overline{x_1} = 2;\ \overline{x_1} * \overline{y_1}$
(b) $fv(e) = \{y_1\}$
(c) $\langle\ \underline{4},\ \langle 2,\ x_1\rangle,\ \langle \underline{1},\ 2\rangle,\ \langle\ \underline{3},\ \langle \underline{2},\ x_1\rangle\ \underline{2},\ \langle \underline{2},\ \mathrm{y}\rangle\ \rangle\ \rangle$

(iii) $e_3 = const\ y = y;\ const\ y = y;\ y$

(a) $const\ \overline{y_2} = \overline{y_1};\ const\ \overline{y_3} = \overline{y_2};\ \overline{y_3}$
(b) $fv(e) = \{y_1\}$
(c) $\langle\ \underline{4},\ \langle \underline{2},\ y_1\rangle,\ \langle \underline{2},\ y\rangle,\ \langle \underline{4},\ \langle \underline{2},\ y_2\rangle,\ \langle \underline{2},\ y_1\rangle,\ \langle \underline{2},\ y_2\rangle\ \rangle\ \rangle$

(iv) $e_4 = const\ x = (const\ z = 3;\ z + x)$**;** $z + x$

(a) $const\ \overline{x_2} = (const\ \overline{z_1} = 3;\ \overline{z_1} + \overline{x_1});\ \overline{z_2} + \overline{x_2}$
(b) $fv(e) = \{x_1, z_2\}$
(c) $\langle\ \underline{4},\ \langle \underline{2},\ \mathrm{x}\rangle\ \langle \underline{4},\ \langle \underline{2},\ \mathrm{z}\rangle,\ \langle \underline{1},\ 3\rangle,\ \langle\ \underline{3},\ \langle \underline{2},\ \mathrm{z}\rangle,\ \langle \underline{1}\rangle,\ \langle \underline{2},\ \mathrm{x}\rangle\ \rangle\ \rangle,\ \langle\ \underline{3},\ \langle\ \underline{2},\ \mathrm{z}\ \rangle,\ \langle\ \underline{1}\ \rangle,\ \langle\ \underline{2},\ \mathrm{x}\ \rangle\ \rangle\ \rangle$