HW3: Induction

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$$\dfrac{\dfrac{}{\langle x, \sigma\rangle \Downarrow \sigma(x)} \qquad \dfrac{\dfrac{}{\langle y, \sigma\rangle \Downarrow \sigma(y)} \qquad \dfrac{}{\langle z, \sigma\rangle \Downarrow \sigma(z)}}{\langle y + z, \sigma\rangle \Downarrow \sigma(y) + \sigma(z)}}{\langle x * (y + z), \sigma\rangle \Downarrow \sigma(x) * (\sigma(y) + \sigma(z))}$$

1 Problem 1

1.1 t := x; x := y; y := t

1.2 t := y; y := x; x := t

2 Problem 2

In the WHILE language, prove that if

$$\langle \text{while b do } y := y - x, s\rangle \Downarrow s'$$

then there exists an integer k such that

$$s(y) = s'(y) + k * s(x)$$

Please make it explicit if/when you reason by induction on derivations, stating your induction hypothesis.

3 Problem 3

In the WHILE language, prove:

$$\forall c1, c2, c3 : c1; (c2; c3) \approx (c1; c2); c3$$