Problem 10.1 Unification

Answer:

Given that, $S_1 \in \sum_2^p, S_2 \in \sum_3^p, f \in \sum_1^f, g \in \sum_2^f, c \in \sum_0^f$

1. $S_1(g(f(x), g(x, y)), y) =^? S_1(g(z, v), f(w))$

   -- u_{dec}

   $g(f(x), g(x, y)) =^? g(z, v) \wedge y =^? f(w)$

   -- u_{dec}

   $f(x) =^? z \wedge g(x, y) =^? v \wedge y =^? f(w)$

   So, pairs of terms $S_1 \in \sum_2^p$ are unifiable, where most general unifiers are $[z/f(x)], [v/g(x, y)], [f(w)/y]$

2. $S_2(g(f(x), g(x, u)), f(y), z) =^? S_2(g(g(g(u, v), f(w)), f(c)), f(g(u, v)), f(c))$

   -- u_{dec}

   $g\big(f(x), g(x, u)\big) =^? g(g(g(u, v), f(w)), f(c)) \wedge f(y) =^? f(g(u, v)) \wedge z =^? f(c)$

   -- u_{dec}

   $f(x) =^? g(g(u, v), f(w)) \wedge g(x, u) =^? f(c) \wedge y =^? g(u, v) \wedge z =^? f(c)$

   So, pairs of terms $S_2 \in \sum_3^p$ are not unifiable, because $f(x) =^? g(g(u, v), f(w))$ and $g(x, u) =^? f(c)$ are not unifiable.