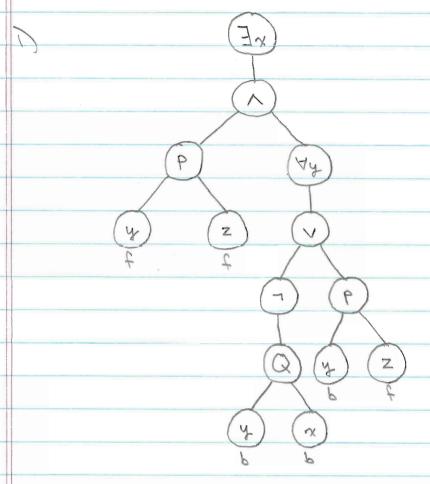
Jessica Jackson (5) Chris Woreikis 220:188 HW3 Spring 2014

2 Parse Trees, Variables and Substitutions Let the formula D be

= 1x (P(y,2) x (ty (- Q(y,x) v P(y,2)))



2) For each variable occurrence in I identify if it is free or bound.

(P(y, z) x (Yy (-Q(y, x) y P(y, z)))

f = free

bound = d

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2 Parce Trees, Variables and Substitutions
3) Consider the variable w, the wary function symbol f and the binary function symbol g.
and the binary turction symbol g.
(a) Which of w), f(x), and g(x,y) are free for x in \$\overline{x}\$? The variable w), f(x), and g(x,y) are free for x in \$\overline{x}\$? x in \$\overline{x}\$ since there are no free occurrences of \$\overline{x}\$.
x in & since there are no free occurences of x.
(b) which of ω , $f(x)$, and $g(x,y)$ are free for y in $\overline{\Phi}$? The variable ω and the binary function $g(x,y)$ are free for y in $\overline{\Phi}$.
are free for y in t.
(c) Compute E [w/x], E[f(w)/y], and \$[g(w,z/z].
$\overline{z} \left[\omega / x \right] = \overline{J} \times \left(P(y, z) \times \left(\overline{Y}_{y} \left(\overline{D}(y, x) \times P(y, z) \right) \right) \right)$
至[f(四)/y]=]x(p(f(四),z)n(Yy(-〇(y,x)vp(y,z))))
$\overline{\Phi}[g(\omega,z)/2] = \overline{\exists} x (P(y,g(\omega,z)) \wedge (\forall y (\neg Q(y,x) \vee P(y,g(\omega,z))))$