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LING 185A
Assignment #1

A. ((\x -> (\y -> y + (3 * x))) 4) 1
⇒ ((\y -> y + (3 * 4))) 1 **lambda reduction**
⇒ ((\y -> y + 12)) 1 **arithmetic**
⇒ 1 + 12 **lambda reduction**
⇒ 13 **arithmetic**

B. ((\x -> (\y -> x + (3 * x))) 4) 1
⇒ ((\y -> 4 + (3 * 4))) 1 **lambda reduction**
⇒ ((\y -> 4 + 12)) 1 **arithmetic**
⇒ ((\y -> 16)) 1 **arithmetic**
⇒ 16 **lambda reduction**

C. ((\x -> (\y -> y + (3 * y))) 4) 1
⇒ ((\y -> y + (3 * y))) 1 **lambda reduction**
⇒ (1 + (3 * 1)) **lambda reduction**
⇒ (1 + 3) **arithmetic**
⇒ 4 **arithmetic**

D. (\y -> y + ((\y -> 3*y) 4)) 5
⇒ (\y -> y + (3 * 4)) 5 **lambda reduction**
⇒ 5 + (3 * 4) **lambda reduction**
⇒ 5 + 12 **arithmetic**
⇒ 17 **arithmetic**

E. (\y -> ((\y -> 3*y) 4) + y) 5
⇒ (\y -> (3 * 4) + y) 5 **lambda reduction**
⇒ (3 * 4) + 5 **lambda reduction**
⇒ 12 + 5 **arithmetic**
⇒ 17 **arithmetic**

F. f ((\fn -> fn Rock) (\x -> whatItBeats x))
⇒ f ((\x -> whatItBeats x) Rock) **lambda reduction**
⇒ f (whatItBeats Rock) **lambda reduction**
⇒ f ((\s -> case s of {Rock -> Scissors; Paper -> Rock; Scissors -> Paper}) Rock) **substitution**
⇒ f (case Rock of {Rock -> Scissors; Paper -> Rock; Scissors -> Paper}) **lambda reduction**

⇒ f Scissors **case reduction**

⇒ (\s -> case s of {Rock -> 334; Paper -> 138; Scissors -> 99}) Scissors
substitution

⇒ case Scissors of {Rock -> 334; Paper -> 138; Scissors -> 99}
lambda reduction

⇒ 99 **case reduction**

G. whatItBeats (case Paper of {Rock -> Paper; Paper -> Rock; Scissors -> Scissors})

⇒ whatItBeats Rock **case reduction**

⇒ (\s -> case s of {Rock -> Scissors; Paper -> Rock; Scissors -> Paper}) Rock
substitution

⇒ case Rock of {Rock -> Scissors; Paper -> Rock; Scissors -> Paper}
lambda reduction

⇒ Scissors **case reduction**

H. (case (n+1) of {3 -> whatItBeats; 2 -> (\s -> Scissors)}) Paper

⇒ (case (1+1) of {3 -> whatItBeats; 2 -> (\s -> Scissors)}) Paper **substitution**

⇒ (case 2 of {3 -> whatItBeats; 2 -> (\s -> Scissors)}) Paper **arithmetic**

⇒ (\s -> Scissors) Paper **case reduction**

⇒ Scissors **lambda reduction**

I. case (Win (whatItBeats Rock)) of {Draw -> n; Win x -> (n + f x)}

⇒ case (Win ((\s -> case s of {Rock -> Scissors; Paper -> Rock; Scissors -> Paper})
Rock)) of {Draw -> n; Win x -> (n + f x)} **substitution**

⇒ case (Win (case Rock of {Rock -> Scissors; Paper -> Rock; Scissors -> Paper}) of
{Draw -> n; Win x -> (n + f x)} **lambda reduction**

⇒ case (Win Scissors) of {Draw -> n; Win x -> (n + f x)} **case reduction**

⇒ n + f Scissors **case reduction**

⇒ 1 + (\s -> case s of {Rock -> 334; Paper -> 138; Scissors -> 99}) Scissors
substitution

⇒ 1 + case Scissors of {Rock -> 334; Paper -> 138; Scissors -> 99}
lambda reduction

⇒ 1 + 99 **case reduction**

⇒ 100 **arithmetic**