CS 550 Lab 2a (Proving Properties of Recursive List Functions)

Week 2 - Apr 10 – Apr 14, 2017.

Name 1:________________________________________________________________________
Drexel Username 1:___________________________________________________

Name 2:________________________________________________________________________
Drexel Username 2:___________________________________________________

Instructions: For this exercise you are encouraged to work in groups of two or three so that you can
discuss the problems, help each other when you get stuck and check your partners work. This lab
provides practice using induction and equational reasoning to prove properties of recursive list
functions. More precisely, the lab asks you to prove properties of the recursive reverse function.

(define (reverse l)
  (if (null? l)
      null
      (append (reverse (rest l)) (cons (first l) null))))

Prove the following 4 properties of the reverse function. You may assume the following properties of
the append function which were proved in lecture.

1.  (and (list? x) (list? y)) → (list? (append x y))
2.  (append null y) = y
3.  x ≠ null → (first (append x y)) = (first x)
4.  (append x null) = x
5.  (length (append x y)) = (+ (length x) (length y))
6.  (append x (append y z)) = (append (append x y) z)

1.  (list? l) → (list? (reverse l))
2.  (length (reverse x)) = (length x)
3.  (reverse (append x y)) = (append (reverse y) (reverse x))
4.  (reverse (reverse x)) = x