

## Homework 03

Name: \_\_\_\_\_

Wes Email: \_\_\_\_\_

Question	Points	Score
1	21	
Total:	21	

If possible, please type/write your answers on this sheet and upload a copy of the PDF to your google drive handin folder. Otherwise, please write the answers in some sort of word processor and upload a PDF. Please name the file `hw03-written.pdf`.

See the homework handout for descriptions of the problems.

### 1. Zip Proof

- (10) (a) Prove the following about your code:

**Theorem 1.** *For all  $l : (\text{int} * \text{string}) \text{ list}$ ,  $\text{zip}(\text{unzip } l) \cong l$ .*

**Solution:** The proof is by structural induction on  $l$ .

**Case for  $[]$**

To show:

Proof:

**Solution: Case for  $x :: xs$**

Inductive hypothesis:

To show:

Proof:

(5) (b) Prove or disprove:

**Theorem 2.** For all  $l1 : \text{int list}$  and  $l2 : \text{string list}$ ,

$$\text{unzip}(\text{zip } (l1, l2)) \cong (l1, l2)$$

**Solution:**

- (5) (c) **NON-COLLABORATIVE CHALLENGE PROBLEM** Prove

**Theorem 3.** For natural number values  $n$ ,  $inverse\_adjacent(n) = n/n+1$ .

**Solution:** The proof is by induction on  $n$ .

**Case for 0**

To show:

Proof:

**Case for  $1 + k$**

Inductive hypothesis:

To show:

Proof:

- (1) (d) Compare `show(inverse_adjacent 200)` with `show(200.0/201.0)`. Explain why

what you see does not match the theorem you proved in the previous task.

**Solution:**