Midterm Exam 1

1.)

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| T | T | T | T | T | T | T | T | T |
| T | T | T | F | T | T | F | F | F |
| T | T | F | T | T | F | T | F | F |
| T | T | F | F | T | F | T | F | F |
| T | F | T | T | F | T | T | F | F |
| T | F | T | F | T | T | F | F | F |
| T | F | F | T | F | T | T | F | F |
| T | F | F | F | T | T | T | T | T |
| F | T | T | T | T | T | T | T | T |
| F | T | T | F | T | T | F | F | T |
| F | T | F | T | T | F | T | F | T |
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| F | F | T | F | T | T | F | F | T |
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2.)Use laws of logic to simplify

Commutativity

Negation

Domination

Identity

Commutativity

Distributivity

Negation

Identity

3.a)

Premise 1) s = Steak, w = Well done, o = Overcooked

Premise 2) a = Fire alarm

Premise 3) b = Batteries

Premise 4) l = Ladder

Premise 5)

Conclude

Premise 5

Premise 4 + Premise 5

Modus Tollens

+ Premise 3

Identity

Domination

Premise 2 +

Modus Tollens

Premise 1 +

Modus Tollens

3.b) Because the premises don’t take into account for every scenario and in real life q can be true while p is false. For example if someone enjoys their steak well done; then the steak would be well done and not considered overcooked even though that would violate which cannot be . Or the fire alarm could go off despite the steak not being overcooked, perhaps something else burned or the fire alarm needs new batteries which would again violate the conditional proposition in a mathematical sense.

3.c)

Premise 1. I consider that if a steak is cooked well done then it has been overcooked

Premise 2. If the steak is overcooked and triggers the fire alarm the fire alarm will go off

Premise 4. When changing the fire alarm batteries only use the ladder that’s in the room.

4.) Show using universal generalization applied twice

Case 1:

Consider an element x

Distributivity

Commutativity

Relative Complacent

Definition of Union

Case 1.1

Def of Union, S = any set

S = any set

Relative Complacent

Case 1.2

Def of Union, S = any set

S = any set, Commutativity

Relative Complacent

Universal Generalization

Case 2:

Consider an element x

Definition of Union

Relative Complacent

Definition of Union

Case 2.1

Def of Union, S = any set

S = any set

Commutativity

Distributivity

Relative Complacent

Case 2.2

Def of Union, S = any set

S = any set, Commutativity

Commutativity

Distributivity

Relative Complacent

Universal Generalization

5.) Disprove by counter-example

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| Y | Y | Y | Y | N | N | Y |
| Y | Y | Y | N | Y | Y | Y |
| Y | Y | N | Y | N | N | Y |
| Y | Y | N | N | Y | Y | Y |
| Y | N | Y | Y | N | N | Y |
| Y | N | Y | N | Y | Y | Y |
| Y | N | N | Y | N | N | Y |
| Y | N | N | N | Y | Y | Y |
| N | Y | Y | Y | N | N | Y |
| N | Y | Y | N | Y | Y | Y |
| N | Y | N | Y | N | N | Y |
| N | Y | N | N | Y | N | N |
| N | N | Y | Y | N | N | Y |
| N | N | Y | N | Y | N | N |
| N | N | N | Y | N | N | Y |
| N | N | N | N | N | N | Y |