CS-2050-All-Sections CS 2050 Homework 1 (HOWARD, FAULKNER, ELLEN)

Vidit Dharmendra Pokharna

TOTAL POINTS

101.5 / 100

QUESTION 1

Question 1 6 pts

1.1 a **2 / 2**

✓ **- 0 pts** *If you study for the exams, then you will do well*

in discrete math.

- 2 pts Incorrect

- 2 pts Missing / No answer

1.2 b **2 / 2**

✓ **- 0 pts** *If you are going out to eat, then you must remember to bring money.*

- 2 pts Incorrect

- 2 pts Missing / No answer

1.3 c **2 / 2**

✓ **- 0 pts** *If you do well on exams, then you will pass the*

course.

- 2 pts Incorrect

- 2 pts Missing / No answer

QUESTION 2

Question 2 8 pts

2.1 a **2 / 2**

✓ **- 0 pts** *True*

- 2 pts False

- 2 pts Missing / No answer

2.2 b **2 / 2**

✓ **- 0 pts** *True*

- 2 pts False

- 2 pts Missing / No answer

2.3 c **2 / 2**

✓ **- 0 pts** *True*

- 2 pts False

- 2 pts Missing / No answer

2.4 d **2 / 2**

✓ **- 0 pts** *False*

- 2 pts True

- 2 pts Missing / No answer

QUESTION 3

Question 3 6 pts

3.1 a **2 / 2**

✓ **- 0 pts** *If you are taking Discrete Math and it is snowing,*

then you are a student.

- 2 pts Missing / No answer

- **2 pts** Incorrect

3.2 b **2 / 2**

✓ **- 0 pts** *It is not snowing or if it is snowing, then you are*

a student

- **2 pts** Incorrect
- **2 pts** Missing / No answer

3.3 c **2 / 2**

✓ **- 0 pts** *It is both snowing and you're taking*

Discrete

Math if and only if you are a student

- **2 pts** Incorrect
- **2 pts** Missing / No answer

QUESTION 4

Question 4 6 pts

4.1 a **3 / 3**

✓ **- 0 pts** *Correct*

- **1 pts** Incorrect translation to predicates
- **1 pts** Incorrect Negation
- **1 pts** Incorrect negation translation to English
- **3 pts** No answer

1 should cite which law is being used when doing logical equivalences

4.2 b **3 / 3**

✓ **- 0 pts** *Correct*

- **1 pts** Incorrect translation to predicates
- **1 pts** Incorrect negation
- **1 pts** Incorrect negation to English
- **3 pts** No answer

QUESTION 5

5 Question 5 **6 / 6**

✓ **- 0 pts** *Converse: If I go to bed, then I finished my schoolwork*

Contrapositive: If I did not go to bed, then I did not finish my school work

Inverse: If I did not finish my schoolwork, then I do not go to bed

- **2 pts** Incorrect Converse
- **2 pts** Incorrect Contrapositive
- **2 pts** Incorrect Inverse
- **6 pts** No answer
- **3 pts** You did not specify which statement was the inverse, converse, or contrapositive.

QUESTION 6

Question 6 24 pts

6.1 a **8 / 8**

✓ **- 0 pts** *Correct*

Missing Columns

- **2 pts** 1 Missing column
- **4 pts** 2 Missing columns
- **6 pts** 3 or more Missing columns

Incorrect Cells

- **1 pts** 1 Incorrect Cell
- **2 pts** 2 Incorrect Cells
- **3 pts** 3 Incorrect Cells
- **4 pts** 4 or more Incorrect Cells

- **1 pts** Used 1/0 instead of T/F
- **3 pts** Incorrect answer due to wrong operation precedence
- **8 pts** No Answer

6.2 b **8 / 8**

✓ **- 0 pts** *Correct*

Missing Columns

- 2 pts 1 Missing column

- 4 pts 2 Missing columns

- 6 pts 3 or more Missing columns

Incorrect Cells

- 1 pts 1 Incorrect Cell

- 2 pts 2 Incorrect Cells

- 3 pts 3 Incorrect Cells

- 4 pts 4 or more Incorrect Cells

- 1 pts Used 1/0 instead of T/F

- 3 pts Incorrect answer due to wrong operation precedence

- 8 pts No Answer

6.3 c **8 / 8**

✓ **- 0 pts** *Correct*

Missing Columns

- 2 pts 1 Missing column

- 4 pts 2 Missing columns

- 6 pts 3 or more Missing columns

Incorrect Cells

- 1 pts 1 Incorrect Cell

- 2 pts 2 Incorrect Cells

- 3 pts 3 Incorrect Cells

- 4 pts 4 or more Incorrect Cells

- 1 pts Used 1/0 instead of T/F

- 3 pts Incorrect answer due to wrong operation precedence

- 8 pts No Answer

QUESTION 7

Question 7 16 pts

7.1 a **7 / 8**

- 0 pts Correct

Incorrect Steps

- 2 pts 1 Incorrect Step

- 4 pts 2 Incorrect Steps

- 6 pts 3 or more Incorrect Steps

Missing Steps

- 2 pts 1 Missing Step

- 4 pts 2 Missing steps

- 6 pts 3 or more Missing Steps

Uncited/Incorrectly Cited Steps

✓ **- 1 pts** *1 Uncited Step*

- 2 pts 2 Uncited Steps

- 3 pts 3 or more Uncited Steps

- 4 pts No cited Steps

- 8 pts No Answer

2 also used commutative

7.2 b **8 / 8**

✓ **- 0 pts** *Correct*

Incorrect Steps

- 2 pts 1 Incorrect Step

- 4 pts 2 Incorrect Steps

- 6 pts 3 or more Incorrect Steps

Missing Steps

- 2 pts 1 Missing Step

- 4 pts 2 Missing steps

- 6 pts 3 or more Missing Steps

Uncited/Incorrectly Cited Steps

- **-1 pts** 1 Uncited Step
- **-2 pts** 2 Uncited Steps
- **-3 pts** 3 or more Uncited Steps
- **-4 pts** No cited Steps
- **-8 pts** No Answer

QUESTION 8

Question 8 20 pts

8.1 a **10 / 10**

✓ **- 0 pts** *Correct*

Missing Columns

- **-2.5 pts** 1 Missing column
- **-5 pts** 2 Missing columns
- **-7.5 pts** 3 or more Missing columns

Incorrect Cells

- **-1.5 pts** 1 Incorrect Cell
- **-3 pts** 2 Incorrect Cells
- **-4.5 pts** 3 Incorrect Cells
- **-6 pts** 4 or more Incorrect Cells
- **-1 pts** Used 1/0 instead of T/F
- **-4 pts** Incorrect answer due to wrong operation precedence
- **-10 pts** No Answer

8.2 b **10 / 10**

✓ **- 0 pts** *Correct*

- **-1 pts** Not using strict equivalency connecting the LHS to the RHS.

Incorrect Steps

- **-2 pts** 1 Incorrect Step
- **-4 pts** 2 Incorrect Steps
- **-6 pts** 3 or more Incorrect Steps

Missing Steps

- **-2 pts** 1 Missing Step
- **-4 pts** 2 Missing steps
- **-6 pts** 3 or more Missing Steps

Uncited/Miscited Steps

- **-1 pts** 1 Uncited Step
- **-2 pts** 2 Uncited Steps
- **-3 pts** 3 or more Uncited Steps
- **-5 pts** No cited Steps
- **-10 pts** No Answer

3 Needed to cite conditional disjunction.

4 same here

QUESTION 9

9 Question 9 **8 / 8**

✓ **- 0 pts** *Correct*

- **-2 pts** Incorrect role assignment for A
- **-2 pts** Incorrect role assignment for B
- **-2 pts** Incorrect role assignment for C

Missing Columns

- **-2 pts** 1 Missing column
- **-4 pts** 2 Missing columns
- **-6 pts** 3 or more Missing columns

Incorrect Cells

- **-1 pts** 1 Incorrect Cell
- **-2 pts** 2 Incorrect Cells
- **-3 pts** 3 Incorrect Cells
- **-4 pts** 4 or more Incorrect Cells
- **-1 pts** Used 1/0 instead of T/F

- **8 pts** No Answer

QUESTION 10

10 On Time **2.5 / 0**

✓ **+ 2.5 pts** *On Time (Before Thursday)*

- **0 pts** On Time (Friday)
- **10 pts** 1 day late
- **25 pts** 2 days late

QUESTION 11

11 Matching **0 / 0**

✓ **- 0 pts** *Correct*

- **5 pts** Incorrect

Vidit Pokharna

CS 2050 HW 1

1.
   a. If you study for the exams, then you will do well in discrete math
   b. If you can go out to eat, then you remember to bring money
   c. If you do well on exams, then you will pass the course

2.
   a. $F \rightarrow F \equiv T$
   b. $T \rightarrow T \equiv T$
   c. $F \rightarrow T \equiv T$
   d. $T \rightarrow F \equiv F$

3.
   a. If you are taking discrete math and it is snowing, then you are a student
   b. It is not snowing or if it is snowing, then you are a student
   c. It is snowing and you are taking discrete math if and only if you are a student

4.
   a. Original: $l \rightarrow (\neg\, a \vee \neg\, h)$
      Negation: $\neg(\neg\, l \vee (\neg\, a \vee \neg\, h)) \equiv l \wedge (\neg(\neg\, a) \wedge \neg(\neg\, h)) \equiv l \wedge (\, a \wedge h)$
      English: You are late for class, and you set an alarm and you did your homework
   b. Original: $\neg\, a \rightarrow l$
      Negation: $\neg(\neg(\neg\, a) \vee l) \equiv \neg\, a \wedge \neg\, l$
      English: You do not set an alarm and you are not late for class

5. Converse: If I go to bed, then I finish my school work
   Inverse: If I don't finish my school work, then I don't go to bed
   Contrapositive: If I don't go to bed, then I don't finish my school work

6.
   a.

p	q	$\neg\, p$	$\neg\, q$	$\neg\, p \rightarrow \neg\, q$
T	T	F	F	T
T	F	F	T	T
F	T	T	F	F
F	F	T	T	T

1.1 a **2 / 2**

✓ **- 0 pts** *If you study for the exams, then you will do well in discrete math.*

- 2 pts Incorrect

- 2 pts Missing / No answer

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T	F	F	T	T
F	T	T	F	F
F	F	T	T	T

1.2 b **2 / 2**

✓ **- 0 pts** *If you are going out to eat, then you must remember to bring money.*

- 2 pts Incorrect

- 2 pts Missing / No answer

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T	F	F	T	T
F	T	T	F	F
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1.3 C **2 / 2**

✓ **- 0 pts** *If you do well on exams, then you will pass the course.*

- 2 pts Incorrect

- 2 pts Missing / No answer

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T	F	F	T	T
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2.1 a **2 / 2**

✓ **- 0 pts** *True*

- 2 pts False

- 2 pts Missing / No answer

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2.2 b **2 / 2**

✓ **- 0 pts** *True*

- 2 pts False

- 2 pts Missing / No answer

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2.3 C **2 / 2**

✓ **- 0 pts** *True*

- 2 pts False

- 2 pts Missing / No answer

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2.4 d **2 / 2**

✓ **- 0 pts** *False*

- 2 pts True

- 2 pts Missing / No answer

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3.1 a **2 / 2**

✓ **- 0 pts** *If you are taking Discrete Math and it is snowing, then you are a student.*

- 2 pts Missing / No answer

- 2 pts Incorrect

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3.2 b **2 / 2**

✓ **- 0 pts** *It is not snowing or if it is snowing, then you are a student*

- 2 pts Incorrect

- 2 pts Missing / No answer

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   a.

p	q	$\neg\, p$	$\neg\, q$	$\neg\, p \rightarrow \neg\, q$
T	T	F	F	T
T	F	F	T	T
F	T	T	F	F
F	F	T	T	T

3.3 C **2 / 2**

✓ **- 0 pts** *It is both snowing and you're taking Discrete Math if and only if you are a student*

- 2 pts Incorrect

- 2 pts Missing / No answer

Vidit Pokharna

CS 2050 HW 1

1.
   a. If you study for the exams, then you will do well in discrete math
   b. If you can go out to eat, then you remember to bring money
   c. If you do well on exams, then you will pass the course

2.
   a. $F \rightarrow F \equiv T$
   b. $T \rightarrow T \equiv T$
   c. $F \rightarrow T \equiv T$
   d. $T \rightarrow F \equiv F$

3.
   a. If you are taking discrete math and it is snowing, then you are a student
   b. It is not snowing or if it is snowing, then you are a student
   c. It is snowing and you are taking discrete math if and only if you are a student

4.
   a. Original: $l \rightarrow (\neg\, a \vee \neg\, h)$
      Negation: $\neg(\neg\, l \vee (\neg\, a \vee \neg\, h)) \equiv l \wedge (\neg(\neg\, a) \wedge \neg(\neg\, h)) \equiv l \wedge (\, a \wedge h)$
      English: You are late for class, and you set an alarm and you did your homework
   b. Original: $\neg\, a \rightarrow l$
      Negation: $\neg(\neg(\neg\, a) \vee l) \equiv \neg\, a \wedge \neg\, l$
      English: You do not set an alarm and you are not late for class

5. Converse: If I go to bed, then I finish my school work
   Inverse: If I don't finish my school work, then I don't go to bed
   Contrapositive: If I don't go to bed, then I don't finish my school work

6.
   a.

p	q	$\neg\, p$	$\neg\, q$	$\neg\, p \rightarrow \neg\, q$
T	T	F	F	T
T	F	F	T	T
F	T	T	F	F
F	F	T	T	T

4.1 a **3 / 3**

✓ **- 0 pts** *Correct*

- 1 pts Incorrect translation to predicates

- 1 pts Incorrect Negation

- 1 pts Incorrect negation translation to English

- 3 pts No answer

1 should cite which law is being used when doing logical equivalences

Vidit Pokharna

CS 2050 HW 1

1.
   a. If you study for the exams, then you will do well in discrete math
   b. If you can go out to eat, then you remember to bring money
   c. If you do well on exams, then you will pass the course

2.
   a. $F \rightarrow F \equiv T$
   b. $T \rightarrow T \equiv T$
   c. $F \rightarrow T \equiv T$
   d. $T \rightarrow F \equiv F$

3.
   a. If you are taking discrete math and it is snowing, then you are a student
   b. It is not snowing or if it is snowing, then you are a student
   c. It is snowing and you are taking discrete math if and only if you are a student

4.
   a. Original: $l \rightarrow (\neg\, a \vee \neg\, h)$
      Negation: $\neg(\neg\, l \vee (\neg\, a \vee \neg\, h)) \equiv l \wedge (\neg(\neg\, a) \wedge \neg(\neg\, h)) \equiv l \wedge (\, a \wedge h)$
      English: You are late for class, and you set an alarm and you did your homework
   b. Original: $\neg\, a \rightarrow l$
      Negation: $\neg(\neg(\neg\, a) \vee l) \equiv \neg\, a \wedge \neg\, l$
      English: You do not set an alarm and you are not late for class

5. Converse: If I go to bed, then I finish my school work
   Inverse: If I don't finish my school work, then I don't go to bed
   Contrapositive: If I don't go to bed, then I don't finish my school work

6.
   a.

p	q	$\neg\, p$	$\neg\, q$	$\neg\, p \rightarrow \neg\, q$
T	T	F	F	T
T	F	F	T	T
F	T	T	F	F
F	F	T	T	T

4.2 b **3 / 3**

✓ **- 0 pts** *Correct*

- 1 pts Incorrect translation to predicates

- 1 pts Incorrect negation

- 1 pts Incorrect negation to English

- 3 pts No answer

Vidit Pokharna

CS 2050 HW 1

1.
   a. If you study for the exams, then you will do well in discrete math
   b. If you can go out to eat, then you remember to bring money
   c. If you do well on exams, then you will pass the course

2.
   a. $F \rightarrow F \equiv T$
   b. $T \rightarrow T \equiv T$
   c. $F \rightarrow T \equiv T$
   d. $T \rightarrow F \equiv F$

3.
   a. If you are taking discrete math and it is snowing, then you are a student
   b. It is not snowing or if it is snowing, then you are a student
   c. It is snowing and you are taking discrete math if and only if you are a student

4.
   a. Original: $l \rightarrow (\neg\, a \vee \neg\, h)$
      Negation: $\neg(\neg\, l \vee (\neg\, a \vee \neg\, h)) \equiv l \wedge (\neg(\neg\, a) \wedge \neg(\neg\, h)) \equiv l \wedge (\, a \wedge h)$
      English: You are late for class, and you set an alarm and you did your homework
   b. Original: $\neg\, a \rightarrow l$
      Negation: $\neg(\neg(\neg\, a) \vee l) \equiv \neg\, a \wedge \neg\, l$
      English: You do not set an alarm and you are not late for class

5. Converse: If I go to bed, then I finish my school work
   Inverse: If I don't finish my school work, then I don't go to bed
   Contrapositive: If I don't go to bed, then I don't finish my school work

6.
   a.

p	q	$\neg\, p$	$\neg\, q$	$\neg\, p \rightarrow \neg\, q$
T	T	F	F	T
T	F	F	T	T
F	T	T	F	F
F	F	T	T	T

5 Question 5 6 / 6

✓ **- 0 pts** *Converse: If I go to bed, then I finished my schoolwork*

Contrapositive: If I did not go to bed, then I did not finish my school work

Inverse: If I did not finish my schoolwork, then I do not go to bed

- 2 pts Incorrect Converse

- 2 pts Incorrect Contrapositive

- 2 pts Incorrect Inverse

- 6 pts No answer

- 3 pts You did not specify which statement was the inverse, converse, or contrapositive.

Vidit Pokharna

CS 2050 HW 1

1.
   a. If you study for the exams, then you will do well in discrete math
   b. If you can go out to eat, then you remember to bring money
   c. If you do well on exams, then you will pass the course

2.
   a. $F \rightarrow F \equiv T$
   b. $T \rightarrow T \equiv T$
   c. $F \rightarrow T \equiv T$
   d. $T \rightarrow F \equiv F$

3.
   a. If you are taking discrete math and it is snowing, then you are a student
   b. It is not snowing or if it is snowing, then you are a student
   c. It is snowing and you are taking discrete math if and only if you are a student

4.
   a. Original: $l \rightarrow (\neg\, a \vee \neg\, h)$
      Negation: $\neg(\neg\, l \vee (\neg\, a \vee \neg\, h)) \equiv l \wedge (\neg(\neg\, a) \wedge \neg(\neg\, h)) \equiv l \wedge (\, a \wedge h)$
      English: You are late for class, and you set an alarm and you did your homework
   b. Original: $\neg\, a \rightarrow l$
      Negation: $\neg(\neg(\neg\, a) \vee l) \equiv \neg\, a \wedge \neg\, l$
      English: You do not set an alarm and you are not late for class

5. Converse: If I go to bed, then I finish my school work
   Inverse: If I don't finish my school work, then I don't go to bed
   Contrapositive: If I don't go to bed, then I don't finish my school work

6.
   a.

p	q	$\neg\, p$	$\neg\, q$	$\neg\, p \rightarrow \neg\, q$
T	T	F	F	T
T	F	F	T	T
F	T	T	F	F
F	F	T	T	T

6.1 a **8 / 8**

✓ **- 0 pts** *Correct*

Missing Columns

- **- 2 pts** 1 Missing column
- **- 4 pts** 2 Missing columns
- **- 6 pts** 3 or more Missing columns

Incorrect Cells

- **- 1 pts** 1 Incorrect Cell
- **- 2 pts** 2 Incorrect Cells
- **- 3 pts** 3 Incorrect Cells
- **- 4 pts** 4 or more Incorrect Cells

- **- 1 pts** Used 1/0 instead of T/F
- **- 3 pts** Incorrect answer due to wrong operation precedence
- **- 8 pts** No Answer

b.

p	q	r	$\neg p$	$(\neg p \wedge q)$	$\neg r$	$(\neg p \wedge q) \rightarrow \neg r$
T	T	T	F	F	F	T
T	T	F	F	F	T	T
T	F	T	F	F	F	T
T	F	F	F	F	T	T
F	T	T	T	T	F	F
F	T	F	T	T	T	T
F	F	T	T	F	F	T
F	F	F	T	F	T	T

c.

p	q	$\neg q$	$(p \rightarrow \neg q)$	$(p \vee q)$	$\neg (p \vee q)$	$(p \rightarrow \neg q) \leftrightarrow \neg (p \vee q)$
T	T	F	F	T	F	T
T	F	T	T	T	F	F
F	T	F	T	T	F	F
F	F	T	T	F	T	T

7.

a.

Expression	Step
$q \rightarrow (p \vee q)$	Original
$\neg q \vee (p \vee q)$	Conditional Identity
$p \vee (\neg q \vee q)$	Associativity
$p \vee T$	Negation Law
T	Domination

6.2 b **8 / 8**

✓ **- 0 pts** *Correct*

Missing Columns

- **- 2 pts** 1 Missing column
- **- 4 pts** 2 Missing columns
- **- 6 pts** 3 or more Missing columns

Incorrect Cells

- **- 1 pts** 1 Incorrect Cell
- **- 2 pts** 2 Incorrect Cells
- **- 3 pts** 3 Incorrect Cells
- **- 4 pts** 4 or more Incorrect Cells

- **- 1 pts** Used 1/0 instead of T/F
- **- 3 pts** Incorrect answer due to wrong operation precedence
- **- 8 pts** No Answer

b.

p	q	r	$\neg p$	$(\neg p \wedge q)$	$\neg r$	$(\neg p \wedge q) \rightarrow \neg r$
T	T	T	F	F	F	T
T	T	F	F	F	T	T
T	F	T	F	F	F	T
T	F	F	F	F	T	T
F	T	T	T	T	F	F
F	T	F	T	T	T	T
F	F	T	T	F	F	T
F	F	F	T	F	T	T

c.

p	q	$\neg q$	$(p \rightarrow \neg q)$	$(p \vee q)$	$\neg (p \vee q)$	$(p \rightarrow \neg q) \leftrightarrow \neg (p \vee q)$
T	T	F	F	T	F	T
T	F	T	T	T	F	F
F	T	F	T	T	F	F
F	F	T	T	F	T	T

7.

a.

Expression	Step
$q \rightarrow (p \vee q)$	Original
$\neg q \vee (p \vee q)$	Conditional Identity
$p \vee (\neg q \vee q)$	Associativity
$p \vee T$	Negation Law
T	Domination

6.3 C **8 / 8**

✓ **- 0 pts** *Correct*

Missing Columns

- **- 2 pts** 1 Missing column
- **- 4 pts** 2 Missing columns
- **- 6 pts** 3 or more Missing columns

Incorrect Cells

- **- 1 pts** 1 Incorrect Cell
- **- 2 pts** 2 Incorrect Cells
- **- 3 pts** 3 Incorrect Cells
- **- 4 pts** 4 or more Incorrect Cells

- **- 1 pts** Used 1/0 instead of T/F
- **- 3 pts** Incorrect answer due to wrong operation precedence
- **- 8 pts** No Answer

b.

p	q	r	$\neg p$	$(\neg p \wedge q)$	$\neg r$	$(\neg p \wedge q) \rightarrow \neg r$
T	T	T	F	F	F	T
T	T	F	F	F	T	T
T	F	T	F	F	F	T
T	F	F	F	F	T	T
F	T	T	T	T	F	F
F	T	F	T	T	T	T
F	F	T	T	F	F	T
F	F	F	T	F	T	T

c.

p	q	$\neg q$	$(p \rightarrow \neg q)$	$(p \vee q)$	$\neg (p \vee q)$	$(p \rightarrow \neg q) \leftrightarrow \neg (p \vee q)$
T	T	F	F	T	F	T
T	F	T	T	T	F	F
F	T	F	T	T	F	F
F	F	T	T	F	T	T

7.

a.

Expression	Step
$q \rightarrow (p \vee q)$	Original
$\neg q \vee (p \vee q)$	Conditional Identity
$p \vee (\neg q \vee q)$	Associativity
$p \vee T$	Negation Law
T	Domination

7.1 a **7 / 8**

- **0 pts** Correct

Incorrect Steps

- **2 pts** 1 Incorrect Step
- **4 pts** 2 Incorrect Steps
- **6 pts** 3 or more Incorrect Steps

Missing Steps

- **2 pts** 1 Missing Step
- **4 pts** 2 Missing steps
- **6 pts** 3 or more Missing Steps

Uncited/Incorrectly Cited Steps

✓ **- 1 pts** *1 Uncited Step*

- **2 pts** 2 Uncited Steps
- **3 pts** 3 or more Uncited Steps
- **4 pts** No cited Steps
- **8 pts** No Answer

2 also used commutative

b.

Expression	Step
$(p \to q) \land (p \to \neg q)$	Original
$(\neg p \lor q) \land (p \to \neg q)$	Conditional Identity
$(\neg p \lor q) \land (\neg p \lor \neg q)$	Conditional Identity
$(\neg p \land \neg p) \lor (\neg p \land \neg q) \lor (q \land \neg p) \lor (q \land \neg q)$	Distributivity
$(\neg p \land \neg p) \lor (q \land \neg q) \lor (\neg p \land \neg q) \lor (q \land \neg p)$	Commutativity
$\neg p \lor (q \land \neg q) \lor (\neg p \land \neg q) \lor (q \land \neg p)$	Idempotent
$(q \land \neg q) \lor \neg p \lor (\neg p \land \neg q) \lor (q \land \neg p)$	Commutativity
$F \lor \neg p \lor (\neg p \land \neg q) \lor (q \land \neg p)$	Negation Law
$\neg p \lor (\neg p \land \neg q) \lor (q \land \neg p) \lor F$	Commutativity
$\neg p \lor (q \land \neg p) \lor F$	Absorption
$\neg p \lor (\neg p \land q) \lor F$	Commutativity
$\neg p \lor F$	Absorption
$\neg p$	Identity

8.

a.

p	q	$(p \land q)$	$(p \land q) \to q$	$\neg q$	$(p \land \neg q)$	$(p \land \neg q) \to \neg q$	$(p \land q) \to q \equiv (p \land \neg q) \to \neg q$
T	T	T	T	F	F	T	T
T	F	F	T	T	T	T	T
F	T	F	T	F	F	T	T
F	F	F	T	T	F	T	T

Therefore, the statement $(p \land q) \to q \equiv (p \land \neg q) \to \neg q$ is true by the truth table.

b.

Expression	Step
$(p \land q) \to q$	LHS
$\neg (p \land q) \lor q$	Conditional Identity
$(\neg p \lor \neg q) \lor q$	DeMorgan's Law
$(\neg p \lor q) \lor \neg q$	Associativity
$\neg (p \land \neg q) \lor \neg q$	Inverse DeMorgan's Law
$(p \land \neg q) \to \neg q$	Inverse Conditional Identity

The last statement represents the RHS. Therefore, the statement $(p \land q) \to q \equiv (p \land \neg q) \to \neg q$ is true by logical equivalence.

7.2 b **8 / 8**

✓ **- 0 pts** *Correct*

Incorrect Steps

- **- 2 pts** 1 Incorrect Step
- **- 4 pts** 2 Incorrect Steps
- **- 6 pts** 3 or more Incorrect Steps

Missing Steps

- **- 2 pts** 1 Missing Step
- **- 4 pts** 2 Missing steps
- **- 6 pts** 3 or more Missing Steps

Uncited/Incorrectly Cited Steps

- **- 1 pts** 1 Uncited Step
- **- 2 pts** 2 Uncited Steps
- **- 3 pts** 3 or more Uncited Steps
- **- 4 pts** No cited Steps
- **- 8 pts** No Answer

b.

Expression	Step
$(p \to q) \land (p \to \neg q)$	Original
$(\neg p \lor q) \land (p \to \neg q)$	Conditional Identity
$(\neg p \lor q) \land (\neg p \lor \neg q)$	Conditional Identity
$(\neg p \land \neg p) \lor (\neg p \land \neg q) \lor (q \land \neg p) \lor (q \land \neg q)$	Distributivity
$(\neg p \land \neg p) \lor (q \land \neg q) \lor (\neg p \land \neg q) \lor (q \land \neg p)$	Commutativity
$\neg p \lor (q \land \neg q) \lor (\neg p \land \neg q) \lor (q \land \neg p)$	Idempotent
$(q \land \neg q) \lor \neg p \lor (\neg p \land \neg q) \lor (q \land \neg p)$	Commutativity
$F \lor \neg p \lor (\neg p \land \neg q) \lor (q \land \neg p)$	Negation Law
$\neg p \lor (\neg p \land \neg q) \lor (q \land \neg p) \lor F$	Commutativity
$\neg p \lor (q \land \neg p) \lor F$	Absorption
$\neg p \lor (\neg p \land q) \lor F$	Commutativity
$\neg p \lor F$	Absorption
$\neg p$	Identity

8.

a.

p	q	$(p \land q)$	$(p \land q) \to q$	$\neg q$	$(p \land \neg q)$	$(p \land \neg q) \to \neg q$	$(p \land q) \to q \equiv (p \land \neg q) \to \neg q$
T	T	T	T	F	F	T	T
T	F	F	T	T	T	T	T
F	T	F	T	F	F	T	T
F	F	F	T	T	F	T	T

Therefore, the statement $(p \land q) \to q \equiv (p \land \neg q) \to \neg q$ is true by the truth table.

b.

Expression	Step
$(p \land q) \to q$	LHS
$\neg (p \land q) \lor q$	Conditional Identity
$(\neg p \lor \neg q) \lor q$	DeMorgan's Law
$(\neg p \lor q) \lor \neg q$	Associativity
$\neg (p \land \neg q) \lor \neg q$	Inverse DeMorgan's Law
$(p \land \neg q) \to \neg q$	Inverse Conditional Identity

The last statement represents the RHS. Therefore, the statement $(p \land q) \to q \equiv (p \land \neg q) \to \neg q$ is true by logical equivalence.

8.1 a **10 / 10**

✓ **- 0 pts** *Correct*

Missing Columns

- 2.5 pts 1 Missing column

- 5 pts 2 Missing columns

- 7.5 pts 3 or more Missing columns

Incorrect Cells

- 1.5 pts 1 Incorrect Cell

- 3 pts 2 Incorrect Cells

- 4.5 pts 3 Incorrect Cells

- 6 pts 4 or more Incorrect Cells

- 1 pts Used 1/0 instead of T/F

- 4 pts Incorrect answer due to wrong operation precedence

- 10 pts No Answer

b.

Expression	Step
$(p \to q) \land (p \to \neg q)$	Original
$(\neg p \lor q) \land (p \to \neg q)$	Conditional Identity
$(\neg p \lor q) \land (\neg p \lor \neg q)$	Conditional Identity
$(\neg p \land \neg p) \lor (\neg p \land \neg q) \lor (q \land \neg p) \lor (q \land \neg q)$	Distributivity
$(\neg p \land \neg p) \lor (q \land \neg q) \lor (\neg p \land \neg q) \lor (q \land \neg p)$	Commutativity
$\neg p \lor (q \land \neg q) \lor (\neg p \land \neg q) \lor (q \land \neg p)$	Idempotent
$(q \land \neg q) \lor \neg p \lor (\neg p \land \neg q) \lor (q \land \neg p)$	Commutativity
$F \lor \neg p \lor (\neg p \land \neg q) \lor (q \land \neg p)$	Negation Law
$\neg p \lor (\neg p \land \neg q) \lor (q \land \neg p) \lor F$	Commutativity
$\neg p \lor (q \land \neg p) \lor F$	Absorption
$\neg p \lor (\neg p \land q) \lor F$	Commutativity
$\neg p \lor F$	Absorption
$\neg p$	Identity

8.

a.

p	q	$(p \land q)$	$(p \land q) \to q$	$\neg q$	$(p \land \neg q)$	$(p \land \neg q) \to \neg q$	$(p \land q) \to q \equiv (p \land \neg q) \to \neg q$
T	T	T	T	F	F	T	T
T	F	F	T	T	T	T	T
F	T	F	T	F	F	T	T
F	F	F	T	T	F	T	T

Therefore, the statement $(p \land q) \to q \equiv (p \land \neg q) \to \neg q$ is true by the truth table.

b.

Expression	Step
$(p \land q) \to q$	LHS
$\neg (p \land q) \lor q$	Conditional Identity
$(\neg p \lor \neg q) \lor q$	DeMorgan's Law
$(\neg p \lor q) \lor \neg q$	Associativity
$\neg (p \land \neg q) \lor \neg q$	Inverse DeMorgan's Law
$(p \land \neg q) \to \neg q$	Inverse Conditional Identity

The last statement represents the RHS. Therefore, the statement $(p \land q) \to q \equiv (p \land \neg q) \to \neg q$ is true by logical equivalence.

8.2 b **10 / 10**

✓ **- 0 pts** *Correct*

- 1 pts Not using strict equivalency connecting the LHS to the RHS.

Incorrect Steps

- 2 pts 1 Incorrect Step

- 4 pts 2 Incorrect Steps

- 6 pts 3 or more Incorrect Steps

Missing Steps

- 2 pts 1 Missing Step

- 4 pts 2 Missing steps

- 6 pts 3 or more Missing Steps

Uncited/Miscited Steps

- 1 pts 1 Uncited Step

- 2 pts 2 Uncited Steps

- 3 pts 3 or more Uncited Steps

- 5 pts No cited Steps

- 10 pts No Answer

3 Needed to cite conditional disjunction.

4 same here

9.

p: A is a viking
q: B is a viking
r: C is a viking

A: $(p \vee \neg q)$
B: $(r \rightarrow \neg p)$
C: $(\neg r \vee \neg p) \rightarrow q$

p	q	r	$\neg p$	$\neg q$	$\neg r$	$(p \vee \neg q)$	$(r \rightarrow \neg p)$	$(\neg r \vee \neg p)$	$(\neg r \vee \neg p) \rightarrow q$
T	T	T	F	F	F	T	F	F	T
T	T	F	F	F	T	T	T	T	T
T	F	T	F	T	F	T	F	F	T
T	F	F	F	T	T	T	T	T	F
F	T	T	T	F	F	F	T	T	T
F	T	F	T	F	T	F	T	T	T
F	F	T	T	T	F	T	T	T	F
F	F	F	T	T	T	T	T	T	F

$p \leftrightarrow (p \vee \neg q)$	$q \leftrightarrow (r \rightarrow \neg p)$	$r \leftrightarrow (\neg r \vee \neg p) \rightarrow q$	$(p \leftrightarrow (p \vee \neg q)) \wedge (q \leftrightarrow (r \rightarrow \neg p)) \wedge (r \leftrightarrow (\neg r \vee \neg p) \rightarrow q)$
T	F	T	F
T	T	F	F
T	T	T	T
T	F	T	F
T	T	T	T
T	T	F	F
F	F	F	F
F	F	T	F

Seeing that we produce only two trues in the last column of the above table, we can see the only combinations that work are: (p is T, q is F, and r is T) and (p is F, q is T, r is T). Therefore, we can conclude that C is a viking, but we cannot determine the status of A and B due to unconclusive results about them.

9 Question 9 8 / 8

✓ **- 0 pts** *Correct*

- 2 pts Incorrect role assignment for A

- 2 pts Incorrect role assignment for B

- 2 pts Incorrect role assignment for C

Missing Columns

- 2 pts 1 Missing column

- 4 pts 2 Missing columns

- 6 pts 3 or more Missing columns

Incorrect Cells

- 1 pts 1 Incorrect Cell

- 2 pts 2 Incorrect Cells

- 3 pts 3 Incorrect Cells

- 4 pts 4 or more Incorrect Cells

- 1 pts Used 1/0 instead of T/F

- 8 pts No Answer

10 On Time **2.5 / 0**

✓ **+ 2.5 pts** *On Time (Before Thursday)*

- 0 pts On Time (Friday)

- 10 pts 1 day late

- 25 pts 2 days late

11 Matching **0 / 0**

✓ **- 0 pts** *Correct*

- 5 pts Incorrect