Problem 1.

(a) Set 2.1

13. $\neg(p \wedge q) \vee (p \vee q)$

p	q	$\neg(p \wedge q)$	$(p \vee q)$	$\neg(p \wedge q) \vee (p \vee q)$
F	F	T	F	T
F	T	T	T	T
T	F	T	T	T
T	T	F	T	T

17. $\neg(p \wedge q) \stackrel{?}{\equiv} \neg p \wedge \neg q$

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

$\neg(p \wedge q) \not\equiv \neg p \wedge \neg q$ because they do not have identical truth values for all possible substitutions.

(b) Set 2.1

22. $p \wedge (q \vee r) \stackrel{?}{\equiv} (p \wedge q) \vee (p \wedge r)$

p	q	r	$p \wedge (q \vee r)$	$(p \wedge q) \vee (p \wedge r)$
F	F	F	F	F
F	F	T	F	F
F	T	F	F	F
F	T	T	F	F
T	F	F	F	F
T	F	T	T	T
T	T	F	T	T
T	T	T	T	T

$p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$ because they have identical truth values for all possible substitutions.

24. $(p \vee q) \vee (p \wedge r) \stackrel{?}{\equiv} (p \vee q) \wedge r$

p	q	r	$(p \vee q) \vee (p \wedge r)$	$(p \vee q) \wedge r$
F	F	F	F	F
F	F	T	F	F
F	T	F	T	F
F	T	T	T	T
T	F	F	T	F
T	F	T	T	T
T	T	F	T	F
T	T	T	T	T

$(p \vee q) \vee (p \wedge r) \not\equiv (p \vee q) \wedge r$ because they do not have identical truth values for all possible substitutions.

(c) Set 2.1

42.
43.

(d) Set 2.1

46.

(a) aaa
(b) bbb

(e) Set 2.2

6.
8.
13.

(a) aaa
(b) bbb

(f) Set 2.2

10.
11.

(g) Set 2.2

30.
31.

(h) Set 2.2

25.
27.

Problem 2.

(a) Set 2.1

26.
28.
29.
30.
31.

(b) Set 2.1

33.
35.
37.
39.

(c) Set 2.2

20.

(a)
(b)

(c)
(d)
(e)
(f)
(g)

Problem 3.

(a)

Problem 4.

(a)

Problem 5.

(a)

Problem 6.

(a)

Problem 7.

(a)