Øving 1

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Seksjon 1.1, s. 14

$\boxed{14}$ (c) You missing the final exam implies not passing the course.

(f) You have the flu and you miss the final exam or you don't miss the final exam and you pass the course.

$\boxed{16}$ (a) $r \wedge \neg q$

(e) $(p \wedge q) \rightarrow r$

Seksjon 1.3, s. 38

$\boxed{12}$ (a) $(\neg p \wedge (p \vee q)) \rightarrow q$

p	q	$\neg p$	$p \vee q$	$\neg p \wedge (p \vee q)$	$\neg p \wedge (p \vee q) \rightarrow q$
0	0	1	0	0	1
0	1	1	1	1	1
1	0	0	1	0	1
1	1	0	1	0	1

$(\neg p \wedge (p \vee q)) \rightarrow q$ er en tautologi.

(b) $((p \to q) \land (q \to r)) \to (p \to r)$

p	q	r	$p \to q$	$q \to r$	$(p \to q) \land (q \to r)$	$p \to r$	$((p \to q) \land (q \to r)) \to (p \to r)$
0	0	0	1	1	1	1	1
0	0	1	1	1	1	1	1
0	1	0	1	0	0	1	1
0	1	1	1	1	1	1	1
1	0	0	0	1	0	0	1
1	0	1	0	1	0	1	1
1	1	0	1	0	0	0	1
1	1	1	1	1	1	1	1

$((p \to q) \land (q \to r)) \to (p \to r)$ er en tautologi.

(c) $(p \land (p \to q)) \to q$

p	q	$p \to q$	$p \land (p \to q)$	$(p \land (p \to q)) \to q$
0	0	1	0	1
0	1	1	0	1
1	0	0	0	1
1	1	1	1	1

$(p \land (p \to q)) \to q$ er en tautologi.

(d) $((p \lor q) \land (p \to r) \land (q \to r)) \to r$

p	q	r	$p \lor q$	$p \to r$	$q \to r$	$(p \lor q) \land (p \to r) \land (q \to r)$	$((p \lor q) \land (p \to r) \land (q \to r)) \to r$
0	0	0	0	1	1	0	1
0	0	1	0	1	1	0	1
0	1	0	1	1	0	0	1
0	1	1	1	1	1	1	1
1	0	0	1	1	1	1	1
1	0	1	1	1	1	1	1
1	1	0	1	0	0	0	1
1	1	1	1	1	1	1	1

$((p \lor q) \land (p \to r) \land (q \to r)) \to r$ er en tautologi.

Seksjon 1.4, s. 57

$\boxed{24}$ (d) $\forall x \exists y, \neg P(y)$
$P(x)$: "x kan svømme".

(e) $\forall x \exists y, \neg Q(y)$
$Q(x)$: "x vil være rik".

Seksjon 1.5, s. 69, 71

$\boxed{12}$ $I(x)$: "x har tilgang til internett." $C(x, y)$: "x og y har snakket over internett."

(b) $\exists x \exists y, \neg C(x, y)$

(e) $\forall x \exists y, \neg C(y, x)$

$\boxed{30}$ (c) $\neg \exists y (Q(y) \wedge \forall x \neg R(x, y))$
$\equiv \forall y \neg (Q(y) \wedge \forall x \neg R(x, y))$
$\equiv \forall y (\neg Q(y) \vee \neg \forall x \neg R(x, y))$
$\equiv \forall y (\neg Q(y) \vee \exists x \neg\neg R(x, y))$
$\equiv \forall y (\neg Q(y) \vee \exists x R(x, y))$

(e) $\neg \exists y (\forall x \exists z T(x, y, z) \vee \exists x \forall z U(x, y, z))$
$\equiv \forall y \neg (\forall x \exists z T(x, y, z) \vee \exists x \forall z U(x, y, z))$
$\equiv \forall y (\neg \forall x \exists z T(x, y, z) \wedge \neg \exists x \forall z U(x, y, z))$
$\equiv \forall y (\exists x \forall z \neg T(x, y, z) \wedge \forall x \exists z \neg U(x, y, z))$