1.

a) p → q

b) (s^r) → q

c) (¬p ^ r) → q

d) If I don’t finish my computer project before lunch and the sun is not shining, then I shall not play tennis in the afternoon.

e) I shall play tennis in the afternoon if and only if the sun is shining.

2.

a) p→ (p ^ q)

|  |  |  |
| --- | --- | --- |
| p | q | p → (p ^ q) |
| T | T | T |
| T | F | F |
| F | T | T |
| F | F | T |

3.

a) Tautology

b) Contradiction

c) Contingency (neither)

p v q → p

|  |  |  |  |
| --- | --- | --- | --- |
| p | q | p v q | p v q → p |
| T | T | T | T |
| T | F | T | T |
| F | T | T | F |
| F | F | F | T |

4.

a) Prove that (p → q) ^ (¬q ^ (r v ¬q)) = ¬(q v p)

(p → q) ^ (¬q ^ (r v ¬q))

(¬p v q) ^ ¬q Absorption Laws

(¬q ^ ¬p) v (¬q ^ q) Distributive

¬q ^ ¬p Contradiction

¬(q v p) De Morgan’s

b) Prove that p v (p ^ (p v q)) = p

p v (p ^ (p v q))

p v ((p ^ p) v (p ^ q)) Distributive

p v (p v (p ^ q)) Idempotency

p v p Absorption

p Idempotency