

# PR 2 LOGKOM

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3) a)  $\exists x. (\text{makanan}(x) \wedge \forall y. (\text{mahasiswa}(y) \rightarrow \text{suka}(y, x)))$

Terjemahan : Ada makanan yang disukai semua mahasiswa

b)  $\forall y. (\text{mahasiswa}(y) \rightarrow \exists x. (\text{makanan}(x) \wedge \text{suka}(y, x)))$

Terjemahan : Semua mahasiswa menyukai makanan tertentu

5) Pembuktian :

- |  |        |
|--|--------|
| 1) kelas (Jeki) $\wedge$ umur 19 (Jeki)                        | premis |
| 2) $\forall x. (\text{umur } 19(x) \rightarrow \text{sim}(x))$ | premis |
| 3) umur 19 (Jeki)  | AE 1   |
| 4) kelas (Jeki)  | AE 1   |
| 5) umur 19 (Jeki) $\rightarrow$ sim (Jeki)                     | UI 2   |
| 6) sim (Jeki)  | MP 3,5 |
| 7) kelas (Jeki) $\wedge$ sim (Jeki)                            | AI 4,6 |
| 8) $\exists x. (\text{kelas}(x) \wedge \text{sim}(x))$         | EG 7   |

6) Diketahui fakta :

$$\forall x. (p(x) \rightarrow q(x)) \rightarrow \exists x. (r(x) \wedge s(x))$$

$$\forall x. (p(x) \rightarrow s(x)) \wedge \forall x. (s(x) \rightarrow q(x))$$

Buktikan bhw kesimpulan :  $\exists x. s(x)$

- |   |        |
|---|--------|
| 1) $\forall x. (p(x) \rightarrow q(x)) \rightarrow \exists x. (r(x) \wedge s(x))$ | premis |
| 2) $\forall x. (p(x) \rightarrow s(x)) \wedge \forall x. (s(x) \rightarrow q(x))$ | premis |
| 3) $\forall x. (p(x) \rightarrow s(x))$   | AE 2   |
| 4) $p(a) \rightarrow s(a)$  | UI 3   |
| 5) $\forall x. (s(x) \rightarrow q(x))$   | AE 2   |
| 6) $s(a) \rightarrow q(a)$  | UI 5   |
| 7) $p(a) \rightarrow q(a)$  | AI 4,6 |
| 8) $(p(a) \rightarrow q(a)) \rightarrow \exists x. (r(x) \wedge s(x))$            | UI 1   |
| 9) $(p(a) \rightarrow q(a)) \rightarrow ((r(c) \wedge s(c))$                      | EI 8   |
| 10) $r(c) \wedge s(c)$  | MP 7,9 |
| 11) $s(c)$  | AE 10  |
| 12) $\exists x. s(x)$   | EG 11  |

- 9)  $\forall x [p(x) \rightarrow (\exists y [q(x,y) \wedge \sim r(y)] \wedge \sim \exists y [q(x,y) \wedge q(y,x)] \wedge \forall y [\sim p(y) \rightarrow \sim r(x,y)])]$
- I  $\forall x [\sim p(x) \vee (\exists y [q(x,y) \wedge \sim r(y)] \wedge \sim \exists y [q(x,y) \wedge q(y,x)] \wedge \forall y [p(y) \vee \sim r(x,y)])]$
- N  $\forall x [\sim p(x) \vee (\exists y [q(x,y) \wedge \sim r(y)] \wedge \forall y [\sim q(x,y) \vee \sim q(y,x)] \wedge \forall y [p(y) \vee \sim r(x,y)])]$
- S  $\forall x [\sim p(x) \vee (\exists y [q(x,y) \wedge \sim r(y)] \wedge \forall w [\sim q(x,w) \vee \sim q(w,x)] \wedge \forall z [p(z) \vee \sim r(x,z)])]$
- E  $\forall x [\sim p(x) \vee ([q(x,f(x)) \wedge \sim r(f(x))] \wedge \forall w [\sim q(x,w) \vee \sim q(w,x)] \wedge \forall z [p(z) \vee \sim r(x,z)])]$
- A  $\forall x [\sim p(x) \vee ([q(x,f(x)) \wedge \sim r(f(x))] \wedge [\sim q(x,w) \vee \sim q(w,x)] \wedge [p(z) \vee \sim r(x,z)])]$
- $\sim p(x) \vee ([q(x,f(x)) \wedge \sim r(f(x))] \wedge [\sim q(x,w) \vee \sim q(w,x)] \wedge [p(z) \vee \sim r(x,z)])$
- D  $(\sim p(x) \vee q(x,f(x))) \wedge (\sim p(x) \vee \sim r(f(x))) \wedge (\sim p(x) \vee \sim q(x,w) \vee \sim q(w,x)) \wedge (\sim p(x) \vee p(z) \vee \sim r(x,z))$
- O  $\{ \sim p(x), q(x,f(x)) \} \quad \{ \sim p(x), \sim q(x,w), \sim q(w,x) \}$   
 $\{ \sim p(x), \sim r(f(x)) \} \quad \{ \sim p(x), p(z), \sim r(x,z) \}$

10) a) color (tweety, yellow) and color (x, y)

compare: color (tweety, yellow), color (x, y), { }

Compare: color, color, { }

Result: { }

compare: x, tweety, { }

Result: {x ← tweety }

compare: y, yellow, {x ← tweety }

Result: {x ← tweety, y ← yellow }

Result: {x ← tweety, y ← yellow }

b) color (tweety, yellow) & color (x, x)

compare: color (x, x), color (tweety, yellow), { }

compare: color, color, { }

Result: { }

compare: x, tweety, { }

Result: {x ← tweety }

compare: x, yellow, {x ← tweety }

compare: tweety, yellow, {x ← tweety }

Result: fail

Result: fail

Result: fail

→ Gagal km terdapat ekspresi yg tdk identikal, namun keduanya adlh konstanta

⑩ c)  $\text{color}(\text{hat}(\text{postman}), \text{blue})$  dan  $\text{color}(\text{hat}(y), x)$

compare:  $\text{color}(\text{hat}(\text{postman}), \text{blue}), \text{color}(\text{hat}(y), x), \{ \}$

compare:  $\text{color}, \text{color}, \{ \}$

Result:  $\{ \}$

compare:  $\text{hat}(\text{postman}), \text{hat}(y), \{ \}$

compare:  $\text{hat}, \text{hat}, \{ \}$

Result:  $\{ \}$

compare:  $\text{postman}, y, \{ \}$

Result:  $\{ y \leftarrow \text{postman} \}$

compare:  $x, \text{blue}, \{ y \leftarrow \text{postman} \}$

Result:  $\{ x \leftarrow \text{blue}, y \leftarrow \text{postman} \}$

Result:  $\{ x \leftarrow \text{blue}, y \leftarrow \text{postman} \}$

Result:  $\{ x \leftarrow \text{blue}, y \leftarrow \text{postman} \}$

d)  $q(x, x) = q(y, f(y))$

compare:  $q(x, x), q(y, f(y)), \{ \}$

compare:  $q, q, \{ \}$

Result:  $\{ \}$

compare:  $x, y, \{ \}$

Result:  $\{ y \leftarrow x \}$

compare:  $x, f(y), \{ y \leftarrow x \}$

compare:  $x, f(x), \{ y \leftarrow x \}$

Result:  $\{ x \leftarrow f(x), y \leftarrow x \}$

Result:  $\{ x \leftarrow f(x), y \leftarrow x \}$

Result:  $\{ x \leftarrow f(x), y \leftarrow x \}$

e)  $p(A, x, f(g(y))) = p(z, f(z), f(A))$

compare:  $p(A, x, f(g(y))), p(z, f(z), f(A)), \{ \}$

compare:  $p, p, \{ \}$

Result:  $\{ \}$

compare:  $A, z, \{ \}$

Result:  $\{ z \leftarrow A \}$

compare:  $x, f(z), \{ z \leftarrow A \}$

compare:  $x, f(A), \{ z \leftarrow A \}$

Result:  $\{ x \leftarrow f(A), z \leftarrow A \}$

compare:  $f(g(y)), f(A), \{ x \leftarrow f(A), z \leftarrow A \}$

Result: fail

Result: fail

Result: fail

→ Gagal km keduanya merupakan konstanta



⑩ F)  $f(x, g(f(a), u)) = f(g(u, v), x)$

compare:  $f(x, g(f(a), u)), f(g(u, v), x), \{ \}$

compare:  $f, f, \{ \}$

Result:  $\{ \}$

compare:  $x, g(u, v), \{ \}$

Result:  $\{x \leftarrow g(u, v)\}$

compare:  $g(f(a), u), x, \{x \leftarrow g(u, v)\}$

compare:  $g(f(a), u), g(u, v), \{x \leftarrow g(u, v)\}$

compare:  $g, g, \{x \leftarrow g(u, v)\}$

Result:  $\{x \leftarrow g(u, v)\}$

compare:  $f(a), u, \{x \leftarrow g(u, v)\}$

Result:  $\{u \leftarrow f(a), x \leftarrow g(u, v)\}$

compare:  $u, v, \{u \leftarrow f(a), x \leftarrow g(u, v)\}$

compare:  $f(a), v, \{u \leftarrow f(a), x \leftarrow g(u, v)\}$

Result:  $\{v \leftarrow f(a), u \leftarrow f(a), x \leftarrow g(u, v)\}$

Result:  $\{v \leftarrow f(a), u \leftarrow f(a), x \leftarrow g(f(a), f(a))\}$

Result:  $\{v \leftarrow f(a), u \leftarrow f(a), x \leftarrow g(f(a), f(a))\}$

Result:  $\{v \leftarrow f(a), u \leftarrow f(a), x \leftarrow g(f(a), f(a))\}$

⑫ 1.  $\{ \sim p(x, y), q(x, y, f(x, y)) \}$

2.  $\{ \sim r(y, z), q(a, y, z) \}$

3.  $\{ r(y, z), \sim q(a, y, z) \}$

4.  $\{ p(x, g(x)), q(x, g(x), z) \}$

5.  $\{ \sim r(x, y), \sim q(x, w, z) \}$

6.  $\{ q(x, g(x), f(x, g(x))) \}$

7.  $\{ r(g(a), f(a, g(a))) \}$

8.  $\{ \sim r(x, y) \}$

9.  $\{ \}$

premise

premise

premise

premise

premise

1, 4

MGU:  $\{y \leftarrow g(x), z \leftarrow f(x, g(x))\}$

3, 6

MGU:  $\{x \leftarrow a, y \leftarrow g(a), z \leftarrow f(a, g(a))\}$

5, 6

MGU:  $\{w \leftarrow g(x), t \leftarrow f(x, g(x))\}$

7, 8

MGU:  $\{x \leftarrow g(a), y \leftarrow f(a, g(a))\}$