

215681107 S.1
 1 PRACTICE #1 12/28

P	q	r	<u>$p \vee q \vee r$</u>
T	T	T	T
T	T	F	T
T	F	T	T
T	F	F	T
F	T	T	T
F	F	T	T
F	F	F	F

$$2^3 = 8 \quad \textcircled{C} \quad \textcircled{D}$$

$p \vee q \vee r$

P	q	r	$q \wedge r$	<u>$p \rightarrow q \wedge r$</u>
T	T	T	T	T
T	T	F	F	F
T	F	T	F	F
T	F	F	F	F
F	T	T	T	T
F	T	F	F	T
F	F	T	F	T
F	F	F	F	T

$$p \rightarrow q \wedge r \quad \textcircled{a}$$

$$2^3 = 8$$

q	r	$\neg r$	$q \Rightarrow r$
T	T	F	F
T	F	T	T
F	T	F	T
F	F	T	T

$$q \Rightarrow r \quad \textcircled{C}$$

$$2^2 = 4$$

$$(A \vee \neg B) \wedge ((B \oplus C) \rightarrow (C \leftrightarrow D)) \quad \textcircled{D}$$

A	B	C	D	$\neg B$	$A \vee \neg B$	$B \oplus C$	$C \leftrightarrow D$	$(B \oplus C) \rightarrow (C \leftrightarrow D)$	whole express
T	T	T	T	F	T	F	T	T	T
T	T	T	F	F	T	F	F	T	T
T	T	F	T	F	T	F	F	F	F
T	T	F	F	F	T	T	T	T	T
T	F	T	T	T	T	T	T	T	T
T	F	T	F	T	T	T	F	F	F
T	F	F	T	T	T	F	F	T	T
T	F	F	F	T	T	F	T	T	T
F	T	T	T	F	F	F	T	T	F
F	T	T	F	F	F	F	F	T	F
F	T	F	T	F	F	T	T	F	F
F	T	F	F	F	F	T	T	T	T
F	F	T	T	T	T	T	F	T	F
F	F	T	F	T	T	F	F	T	T
F	F	F	T	T	T	F	F	T	T
F	F	F	F	T	T	F	T	T	T

$$p \oplus q \equiv (p \wedge \neg q) \vee (\neg p \wedge q)$$

$$2^2 = 4$$

(c) (3)

p	q	$\neg p$	$\neg q$	$p \wedge \neg q$	$\neg p \wedge q$	whole right expression	$p \oplus q$
T	T	F	F	F	F	F	F
T	F	F	T	T	F	T	T
F	T	T	F	F	T	T	T
F	F	T	T	F	F	F	F

$$(p \oplus q) \oplus q \equiv p$$

$$D \equiv p \oplus q \quad // \text{Defn}$$

$$D \oplus q$$

$$\begin{aligned} & (D \wedge \neg q) \vee (\neg D \wedge q) // \text{Prop P208} \\ & \equiv [(\neg p \wedge \neg q) \vee (\neg \neg p \wedge q)] \wedge \neg q \vee \neg [(\neg p \wedge \neg q) \vee (\neg \neg p \wedge q)] \wedge q // \text{A237} \end{aligned}$$

$$\textcircled{1} (\neg p \wedge \neg q) \vee (\neg \neg p \wedge \neg q) // \text{2f1a}$$

$$\underline{[(\neg p \wedge \neg q) \vee \text{False}] \rightarrow (\neg p \wedge \neg q)} // \text{mso} \quad \underline{\wedge \text{110}}$$

$$\textcircled{2} \neg [(\neg p \wedge \neg q) \vee (\neg \neg p \wedge q)] // \text{2f1a}$$

$$\neg [\text{False} \vee (\neg \neg p \wedge \neg q)] // \text{mso}$$

$$\neg (\neg \neg p \wedge \neg q) // \text{mso}$$

$$\textcircled{1} \vee \textcircled{2}$$

$$(\neg p \wedge \neg q) \vee \neg (\neg \neg p \wedge \neg q) // \text{L3DN mso}$$

$$(\neg p \wedge \neg q) \vee p \vee \neg q // \text{PWN 12} // \text{L3P}$$

$$(\neg p \wedge \neg q) \vee p \equiv p // \text{R18F2} // \text{L3P}$$

$$(A \wedge B) \rightarrow (\neg C) \equiv (A \wedge C) \rightarrow (\neg B)$$

④

$$\neg(A \wedge B) \vee \neg C \quad \text{זהות}$$

$$\neg A \vee \neg B \vee \neg C \quad \text{או}$$

$$(\neg A \vee \neg C) \vee (\neg B) \quad \text{פ.פ}$$

$$\neg(A \wedge C) \vee \neg B \quad \text{פ.פ}$$

$$(A \wedge C) \rightarrow (\neg B) \quad \text{פ.פ}$$

$$\neg(C \wedge (B \rightarrow C)) \wedge (A \rightarrow B) \equiv \neg A \wedge \neg B \wedge \neg C$$

⑤

$$\neg C \wedge (\neg B \vee C) \wedge (\neg A \vee B) \quad \text{זהות}$$

$$\neg C \wedge (\neg B \vee \emptyset) \wedge (\neg A \vee B) \quad \text{פ.פ}$$

$$\neg C \wedge \neg B \wedge \neg A$$

$$\neg A \wedge \neg B \wedge \neg C \quad \text{פ.פ} \quad \text{פ.פ}$$

$$(A \wedge B) \wedge (A \rightarrow C) \wedge (D \rightarrow \neg C) \equiv A \wedge B \wedge C \wedge \neg D$$

⑥

$$(A \wedge B) \wedge (\neg A \vee C) \wedge (\neg D \vee \neg C) \quad \text{זהות}$$

$$(A \wedge B) \wedge (\neg A \vee C) \wedge (\neg D \vee \emptyset) \quad \text{פ.פ}$$

$$(A \wedge B) \wedge C \wedge \neg D$$

$$A \wedge B \wedge C \wedge \neg D \quad \text{פ.פ} \quad \text{פ.פ}$$

$$(A \rightarrow B) \wedge (\neg C) \equiv \neg(A \vee C) \vee \neg(B \vee C)$$

⑦

$$\neg(A \wedge \neg C) \vee (\neg B \wedge \neg C) \quad \text{זהות}$$

$$\neg C \wedge (\neg A \vee B) \quad \text{פ.פ}$$

$$(\neg A \vee B) \wedge \neg C \quad \text{פ.פ}$$

$$(A \rightarrow B) \wedge \neg C \quad \text{פ.פ}$$

$$⑤ @ (P \rightarrow Q) \vee (R \rightarrow P)$$

$$(\neg P \vee Q) \vee (\neg R \vee P) // \text{איך תריב}$$

$$\neg P \vee Q \vee R \vee P // \neg P \neg P$$

$$2^3 = 8$$

Q	R	P	$P \rightarrow Q$	$R \rightarrow P$	whole expression	160
T	T	T	T	T	T	
T	T	F	T	F	T	
T	F	T	T	T	T	
T	F	F	T	T	T	
F	T	T	F	T	T	
F	T	F	T	F	T	
F	F	T	F	T	T	
F	F	F	T	T	T	

$$⑥ (P \leftrightarrow Q) \rightarrow R$$

$$[(P \wedge Q) \vee (\neg P \wedge \neg Q)] \Rightarrow R // \text{כינוס הולך}$$

$$\neg [(\neg (P \wedge Q) \vee (\neg \neg P \wedge \neg \neg Q))] \vee R // \text{הנחתה}$$

$$\neg [(\neg P \wedge \neg Q) \wedge (\neg \neg P \wedge \neg \neg Q)] \vee R // \text{הנחתה}$$

$$[(\neg P \vee \neg Q) \wedge (P \vee Q)] \vee R // \text{הנחתה}$$

(b)

$$2^3 = 8$$

P	Q	R	$P \leftrightarrow Q$	whole expression	$\neg P$
T	T	T	T	T	F
T	T	F	T	F	T
T	F	T	F	T	T
T	F	F	F	T	T
F	T	T	F	T	T
F	T	F	F	T	T
F	F	T	T	T	T
F	F	F	T	F	T

$$\circ (P \rightarrow Q) \vee (R \rightarrow P)$$

$$(\neg P \vee Q) \vee (\neg R \vee P)$$

$$\neg P \vee Q \vee \neg R \vee P \quad \text{// P.F.T}$$

$$2^3 = 8$$

P	Q	R	$P \rightarrow Q$	$R \rightarrow P$	whole expression	$\neg P$
T	T	T	T	T	T	F
T	T	F	T	T	T	F
T	F	T	F	T	T	T
T	F	F	F	T	T	T
F	T	T	T	F	T	T
F	T	F	T	T	T	T
F	F	T	T	F	T	T
F	F	F	T	T	T	T

D) $(P \rightarrow P) \rightarrow (Q \wedge \neg Q)$

$\neg(P \vee P) \rightarrow (Q \wedge \neg Q) // \text{סילוגיזם}$

$T \rightarrow F // \text{טולען}$

$\equiv F // \text{טולען}$

P	Q	$\neg Q$	$P \rightarrow P$	$Q \wedge \neg Q$	whole expression	Proof
T	T	F	T	F	F	טולען
T	F	T	T	F	F	טולען
F	T	F	T	F	F	טולען
F	F	T	T	F	F	טולען

E) $P \rightarrow [(P \oplus Q) \rightarrow Q]$

$P \vee [\neg(P \oplus Q) \vee Q] // \text{סילוגיזם}$

$P \vee [(P \oplus Q) \wedge \neg Q] // \text{טולען}$

$P \vee [P \wedge \neg Q] // \text{טולען}$

$P // \text{טולען}$

 $Z^2 = 4$

P	Q	$P \oplus Q$	$P \oplus Q \rightarrow Q$	whole expression	Proof
T	T	F	T	T	טולען
T	F	T	F	F	טולען
F	T	T	T	T	טולען
F	F	F	T	T	טולען

• יונן פירס m ו n נסכלים, ו $\int_{m=1}^{M=2} \int_{n=1}^{N=2} f(m,n) dm dn$

• יונן פירס m ו n נסכלים, ו $\int_{m=1}^{\infty} \int_{n=1}^{\infty} f(m,n) dm dn$

$$\int_{m=1}^{\infty} \int_{n=1}^{\infty} f(m,n) dm dn = \int_{m=1}^{\infty} f(m,\infty) dm = \int_{m=1}^{\infty} f(m,m) dm$$

• $f(m,n)$ נסכלים, ו $\int_{m=0}^{\infty} \int_{n=0}^{\infty} f(m,n) dm dn$

$$\int_{m=0}^{\infty} \int_{n=0}^{\infty} f(m,n) dm dn = \int_{m=0}^{\infty} f(m,m) dm$$

• $f(m,n)$ נסכלים, ו $\int_{m=0}^{\infty} \int_{n=0}^{\infty} f(m,n) dm dn$

$$\int_{m=0}^{\infty} \int_{n=0}^{\infty} f(m,n) dm dn = \int_{m=0}^{\infty} f(m,0) dm$$

• יונן פירס m ו n נסכלים, ו $\int_{m=0}^{\infty} \int_{n=0}^{\infty} f(m,n) dm dn$

$$\int_{m=0}^{\infty} \int_{n=0}^{\infty} f(m,n) dm dn = \int_{m=0}^{\infty} f(m,0) dm$$

• יונן פירס m ו n נסכלים, ו $\int_{m=0}^{\infty} \int_{n=0}^{\infty} f(m,n) dm dn$

$$\int_{m=0}^{\infty} \int_{n=0}^{\infty} f(m,n) dm dn = \int_{m=0}^{\infty} f(m,0) dm$$

• $\int_{10-N}^{10} \int_{3k}^{2n} \int_{2k}^{3} f(x,y,z) dx dy dz$

$$n=4: 2n=8 \quad 3 \leq n \leq 4 \quad \int_{10}^{10} \int_{12}^{16} \int_{2}^{3} f(x,y,z) dx dy dz$$

• $\int_{10}^{10} \int_{12}^{16} \int_{2}^{3} f(x,y,z) dx dy dz$

$$\text{odd}(10)=F \quad M+N=10 \quad M=6 \quad N=4 \quad \int_{10}^{10} \int_{12}^{16} \int_{2}^{3} f(x,y,z) dx dy dz$$

$$\text{odd}(8)=F \quad M+N=8 \quad M=5 \quad N=3 \quad \int_{10}^{10} \int_{12}^{16} \int_{2}^{3} f(x,y,z) dx dy dz$$

• $\exists x \in N, \forall y \in N (y \leq x)$ (2)

$y \in N$ נסמן $x \in N$ ו- $y \leq x$.
• $\exists x \in N, \forall y \in N (y \leq x)$ (3)

$x \in N$ נסמן $y \in N$ ו- $y \leq x$.
• $\exists y \in R, \forall x \in R (x + x = y)$ (2)

$y \in R$ נסמן $x \in R$ ו- $x + x = y$.
• $\exists y \in R, \forall x \in R (x + x = y)$ (3)

O-N מוכיח $x^2 \geq 0$, $x \in R$ נסמן $y = x^2$ (1)

$\forall x \in R ((x^2 > 0) \Rightarrow (x > 0)) //$ נזען (2)

$\exists x \in R ((x^2 > 0) \vee (x > 0)) //$ נסמן (3)

$\exists x \in R ((x^2 > 0) \wedge (x \leq 0)) //$ נזען (4)

O-N מוכיח $x^2 \geq 0$, $x \in R$ נסמן $y = x^2$ (3)
• O-S מוכיח $x \geq 0$ (4)

$$\textcircled{8} \quad A = \{1, 2\}$$

$$B = \{a, b, c\}$$

$$\textcircled{1c} \quad A \times A = \{(1, 1), (2, 1), (1, 2), (2, 2)\}$$

$$R_{1a} = \{(1, 2), (2, 1)\}$$

$$R_{1b} = \{(1, 1), (2, 2)\}$$

$$R_{1c} = \{(1, 1), (1, 2)\}$$

$$\textcircled{2} \quad A \times B = \{(1, a), (2, a), (1, b), (2, b), (1, c), (2, c)\}$$

$$R_{2a} = \{(1, a), (2, c)\}$$

$$R_{2b} = \{(1, a), (1, b), (1, c)\}$$

$$R_{2c} = \{(1, a), (2, a)\}$$

$$\textcircled{3} \quad B \times A = \{(a, 1), (b, 1), (c, 1), (a, 2), (b, 2), (c, 2)\}$$

$$R_{3a} = \{(a, 1), (c, 2)\}$$

$$R_{3b} = \{(a, 1), (b, 1), (c, 1)\}$$

$$R_{3c} = \{(a, 1), (a, 2)\}$$

$$\textcircled{4} \quad B \times B = \{(a, a), (b, a), (c, a), (a, b), (b, b), (c, b), (a, c), (b, c), (c, c)\}$$

$$R_{4a} = \{(a, a), (c, c)\}$$

$$R_{4b} = \{(a, a), (a, b), (a, c)\}$$

$$R_{4c} = \{(a, a), (b, a), (c, a)\}$$