

$\%T$ n_0 $\&$ n_2 n_0 n_2 \cdot

..... $\%1\%$ \cdot

\cdot

fl $'\$$ $\%*$ $'$ +!- $($ L

$\%A, B$ $A\Delta B = B$ \cdot

$A = \Phi$ \cdot

$\&f : X \rightarrow Y, C, D \subseteq Y$ $f^{-1}(C\Delta D)$ $f^{-1}(C)\Delta f^{-1}(D)$ \cdot

$f^{-1}(C\Delta D) = f^{-1}((C \setminus D) \cup (D \setminus C)) = f^{-1}(C \setminus D) \cup f^{-1}(D \setminus C) =$

$1ff^{-1}(C) \setminus f^{-1}(D) \cup f^{-1}(D) \setminus f^{-1}(C) = f^{-1}(C)\Delta f^{-1}(D)$ \cdot

'' $)$ \cdot

$\% ;$ \cdot

$\& ;$ \cdot

$' ;$ $\text{dieZ}\%$ \cdot

$(;$ $\text{dieZ}\%$ \cdot

$) ;$ \cdot

$* ;$ $\text{d}' ;$ $?_d ;$ \cdot

\cdot

$+$ $;$ \cdot

$(G$ (p, q) $q \geq p - 1$ $k(G) \leq [2q / p]$ $k(G) \leq [2p / q]$ \cdot

\cdot

$k(G) \leq [2q / p]$ \cdot

''K_5 \cdot

K_5 \cdot

K_5 $)$ $\%Z$ $\&$ Z' $+$ \cdot

' 'Z &e' &% &\$ K_5 .

*" D A=\begin{pmatrix}0111\\1010\\0001\\0000\end{pmatrix} .

% A D .

& D R .

▪ k .

% & R=\begin{pmatrix}1111\\1111\\0011\\0001\end{pmatrix} ▪ (A^k)_{ij} .

+ (.

4n 4n+1 .

G q=p(p-1)/2

p=1,2,3 G p\geq 4 G p

4n,4n+1,4n+2,4n+3 n q=p(p-1)/2 4n,4n+1 e

4n 4n+1 .

, " N=\{1,2,3,\mathbb{L}\} f g N\rightarrow N gf=I_N fg\neq I_N (.

f:N\rightarrow N,\forall n\in N,f(n)=n+1; \cdot g:N\rightarrow N,\forall n\in N,g(1)=1,g(n)=n-1,n\geq 2 .

- f:A\rightarrow B,H\subseteq A H A H^c=A\setminus H (.

% f f(H^c) (f(H))^c .

& f f(H^c) (f(H))^c .

\circ % & \mathbb{Q}

$$(f(H^c)) \cap f(A \setminus H) \supseteq f(A) \setminus f(H)$$

$$f(A) = B \quad f(H^c) \supseteq (f(H))^c$$

$$f(H^c) \subseteq (f(H))^c$$

$$\forall y \in f(H^c) \quad x \in H^c \quad y = f(x) \quad x \notin H \quad f$$

$$f(x) \notin f(H) \quad x_1 \in H \quad f(x_1) = f(x) \quad y \in (f(H))^c$$

$$f(H^c) \subseteq (f(H))^c$$

$$*\$ \quad * \quad \cdot$$

$$\% \quad A, B \quad B \neq \emptyset \quad A \times B = B \times B \quad A = B$$

$$\forall x \in A \quad B \neq \emptyset \quad \mathbf{6} \quad \mathbf{m} \quad (x, y) \in A \times B$$

$$(x, y) \in B \times B \quad x \in B \quad A \subseteq B$$

$$\forall x \in B \quad B \neq \emptyset \quad B \quad \mathbf{m} \quad (x, y) \in B \times B$$

$$(x, y) \in A \times B \quad x \in A \quad B \subseteq A$$

$$A = B$$

$$\mathfrak{A} \quad f: X \rightarrow Y \quad f \quad \Leftrightarrow \forall F \in 2^X, f^{-1}(f(F)) = F$$

$$\Rightarrow \forall x \in f^{-1}(f(F)) \quad f(x) \in f(F) \quad F \quad x_1$$

$$f(x) = f(x_1) \quad f \quad x = x_1 \quad x \in F \quad f^{-1}(f(F)) \subseteq F$$

$$\cdot \quad \forall x \in F, f(x) \in f(F) \quad x \in f^{-1}(f(F)) \quad F \subseteq f^{-1}(f(F))$$

$$f^{-1}(f(F)) = F$$

$$\Leftarrow \quad f \quad \exists x_1, x_2 \in X, x_1 \neq x_2 \quad f(x_1) = f(x_2) = y \quad F = \{x_1\}$$

$$f^{-1}(f(F)) = f^{-1}(f(\{x_1\})) = f^{-1}(\{y\}) = \{x_1, x_2\} \quad \{x_1, x_2\} = F = \{x_1\}$$

$$f$$

■ *R* *A* ■

$$R \quad \Leftrightarrow \quad (a,b) \in R \quad (a,c) \in R \quad (b,c) \in R \quad \bullet$$

$$\dots \Rightarrow R \quad A$$

$$(a,b) \in R \quad (a,c) \in R \quad R \quad (b,a) \in R \quad (a,c) \in R \quad .$$

$$R \quad (b,c) \in R \quad .$$

$$\Leftarrow \mathbf{F} \qquad \forall a \in A \quad (a, a) \in R \quad .$$

$$(a,b) \in R \quad (a,a) \in R \quad (b,a) \in R \quad R$$

$$(a,b) \in R \quad (b,c) \in R \quad R$$

$$(b,a) \in R \quad (b,c) \in R \quad (a,c) \in R \quad R$$

$$R \quad A$$

$$R \text{ is } A\text{-reflexive} \iff R \circ R \subseteq R$$

$$\Rightarrow \forall (a,c) \in R \quad \exists b \in A \quad (a,b) \in R \quad (b,c) \in R \quad \mathbf{F}$$

$$(a,c) \in R \quad R \circ R \subseteq R$$

$$\Leftarrow \forall (a,b) \in R \quad (b,c) \in R \quad (a,c) \in R \quad R \subseteq R \quad \mathbf{F}$$

$$\mathbf{G} \quad N = \{1, 2, 3, \mathbf{L}\} \quad S = \{f \mid f : N \rightarrow \{0, 1\}\},$$

B o\$z %q

$$f_1, f_2, f_3, \mathbf{L} \qquad f_i \qquad \mathbb{Z}^n \qquad a_{i1}, a_{i2}, a_{i3}, \mathbf{L}$$

$$b_1, b_2, b_3, \mathbf{L}, b_i = 1 \quad a_{ii} = 0 \quad b_i = 0 \quad f(i) = b_i \quad i \in N$$

f_1, f_2, \mathbf{L}

$$\text{** } G=(V,E) \quad p \quad G \quad u \quad v \quad \bullet$$

$$\deg u + \deg v \geq p-1 \qquad G \qquad \bullet$$

.	G	G	$G_1=(V_1,E_1)$					
	$G_2=(V_2,E_2)$	$ V_1 =n_1, V_2 =p-n_1,$	$\forall u\in V_1,v\in V_2,$.				
		$\deg u\leq n_1-1,\deg v\leq p-n_1-1$.				
		$\deg u+\deg v\leq (n_1-1)+(p-n_1-1)=p-2$.				
		;		.				
+		K_9		.				
	K_9	$\forall v\in V,\deg v=8\geq p/2$	C_1	G_1				
K_9	C_1	G_1	$\deg v=6\geq p/2$	G_1				
	G_1	C_2	C_1	C_2	G_2	G_1	C_2	
		G_2	$\deg v=4$	G_2				
	G_2	L	G_2	C_1,C_2,L			.	
,	"	G	$\mathbb{R}\geq k$	G	k	%	.	
	T	p	s	T	$p-s$.	
	&			k			.	
		$2q=2p-2=\sum_{i=1}^p deg(v_i)\geq 2(p-s-1)+k+s$	$s\geq k$.	
	T	k		.	.			
-	"					.		
		8fUžŁ		D				
	j]Xfj Ł1\$]Xfj Ł	\$	i	fł žj Ł	5	.
	i			D				.
	i	8]Xfj Ł1\$.
%	%	G		G	Q			.
	%	$\forall v\in V$	$\deg(v)\geq 4$	$4p\leq 2q$	G			

	$q \leq 2p - 4$	$4p \leq 4p - 8$	G
v	$\deg(v) \leq 3$		
first	p		
	$p = 1, 2, 3, 4$		
	$p = k$	G	(!
	$p = k + 1$	G	%
	$\deg(v) \leq 3$	$G - v = G_1$	$\exists v \in V$
	G_1	(!	
	$\deg(v) \leq 3$	G	v
v	G	G_1	(!