

$\gamma : v_1, v_2, v_3, v_1, v_6, v_3, v_4, v_5, v_3.$

$G=(V,E)$ —

$G=(V,E)$ —

$G,$

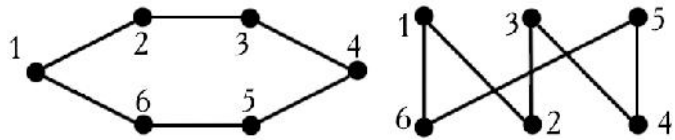
G

1. v

2. $e,$ (. .

3. $v,$).

()



G_1 G_2 - , G_1 - , G_2 - .

(, « ») (+) , , : « ? » ,

. . , .

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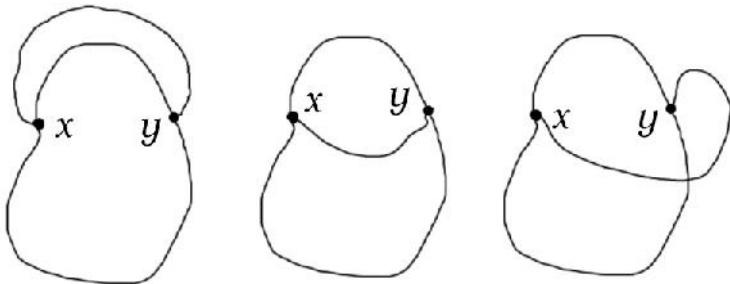
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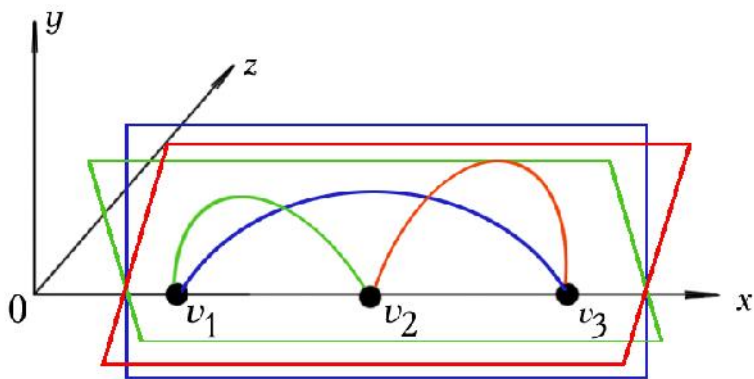
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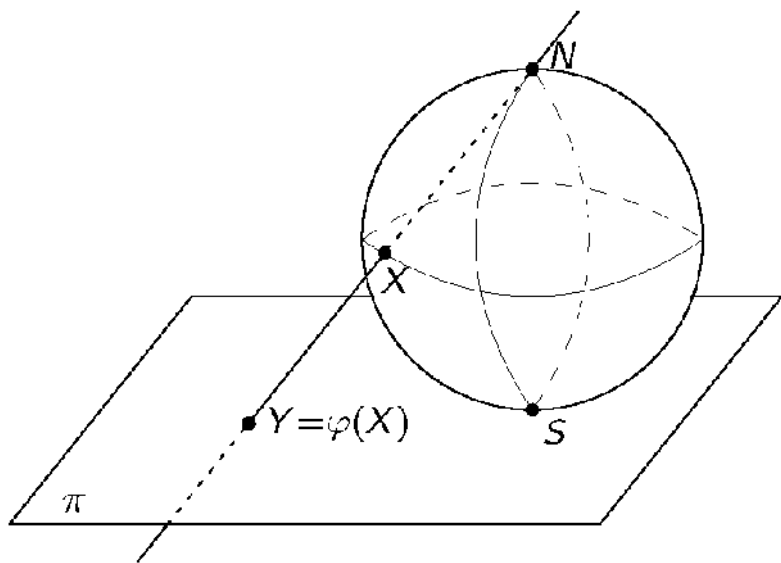
. , S - , x y - , x y , S , x y , S , x y , S x y .



G L , G , G , G , L , G , $G=(V,E)$, OX , $|E|$, $(u,v)\in E$, u , v , G

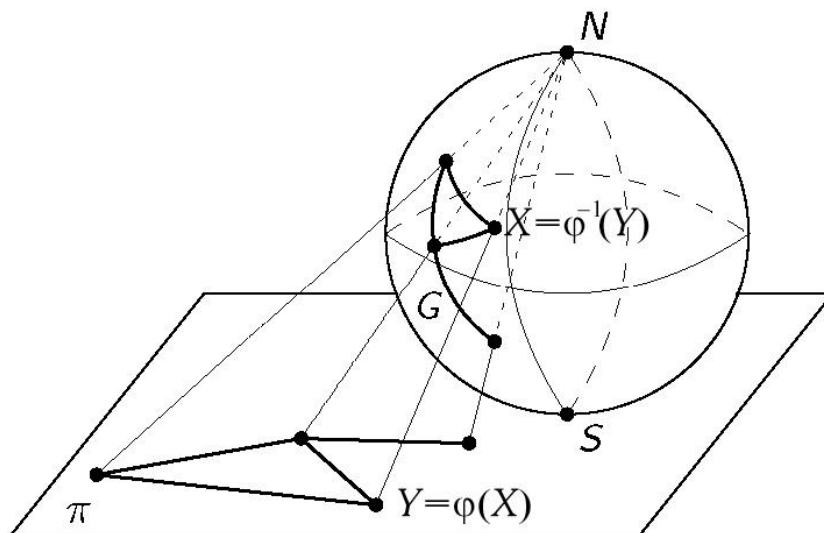


G , G , N , S , f (. .).

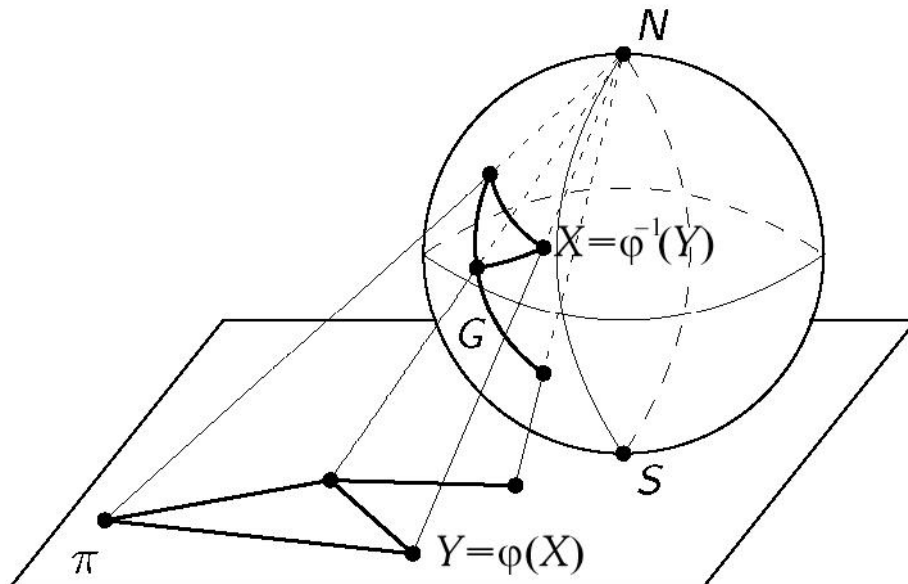


N , S , N , Y , f , X

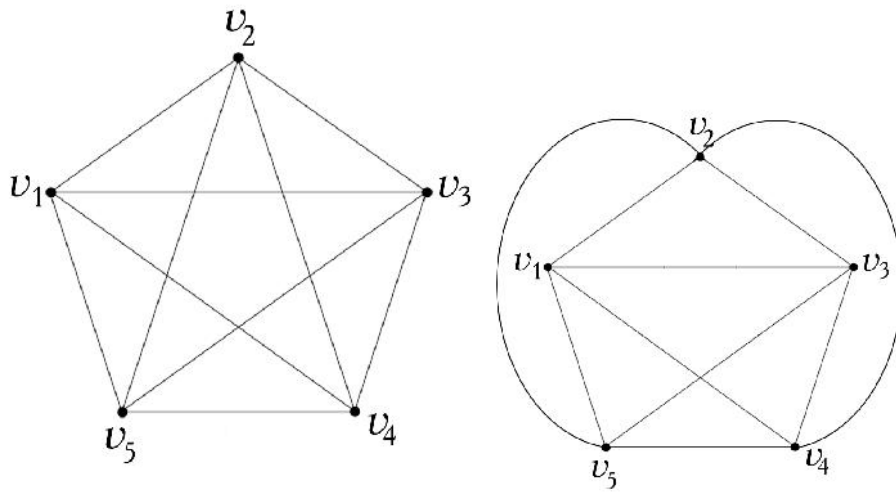
Y $\{ (G).$ $X = \{^{-1}(Y)$
 $G.$ $Y = \{ (X) —$ $G, . . .$
 $\{ (G), ,$
 $\{ ,$
 $G \{ (G).$,
 $G —$, $G.$



$($ $)$
 $\{ ($,
 $\{^{-1}).$:
 $«$ » , N



K_5 $K_{3,3}$



• , K_5 .
 5 , v_1, v_2, v_3, v_4, v_5 ,

((v_1, v_3) ,) .

1. , (v_1, v_3) .

(v_2, v_4) (v_2, v_5) (v_1, v_3) ,

(v_1, v_4) (v_2, v_5) .

(v_3, v_5) (v_2, v_4) . (v_1, v_4) (v_3, v_5) ,

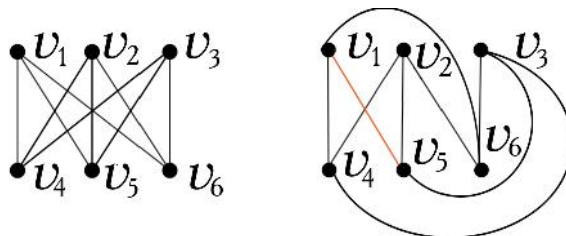
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K_5

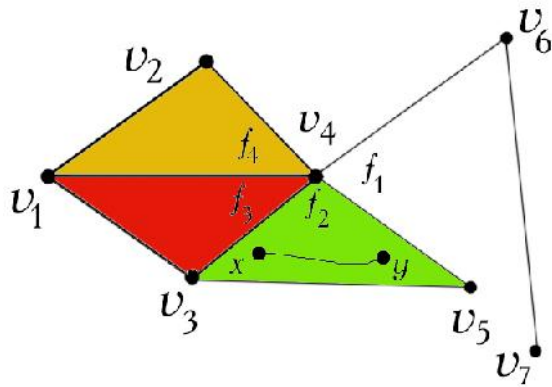
, $K_{3,3}$.



x S , G , G ,

. x y S ,

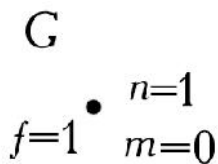
G ,
 G .



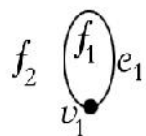
f_1 - , S , G , , 4 : f_1, f_2, f_3, f_4 . G .

n - , G - ,
 m - ,
 f - .
 :
 $n + f = m + 2$.

G .
 1. $m = 0$, $n = 1$
 (G -) $f = 1$ ().
 $n + f = 1 + 1 = 2$, $m + 2 = 0 + 2 = 2$.

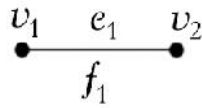


2. G :
 e_1 , ,



$G = (V, E)$
 $V = \{v_1\}$, $E = \{e_1\}$, $F = \{f_1, f_2\}$.
 $n = |V| = 1$, $m = |E| = 1$, $f = |F| = 2$.
 $n + f = 1 + 2 = 3$ $m + 2 = 1 + 2 = 3$.

3. G :
 e_1 G .



$$G = (V, E)$$

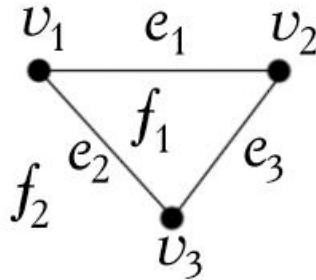
$$V = \{v_1, v_2\}, \quad E = \{e_1\}, \quad F = \{f_1\}.$$

$$n = |V| = 2, \quad m = |E| = 1, \quad f = |F| = 1.$$

$$n + f = 2 + 1 = 3 \quad m + 2 = 1 + 2 = 3.$$

4. G :

- G



$$G = (V, E)$$

$$V = \{v_1, v_2, v_3\}, \quad E = \{e_1, e_2, e_3\},$$

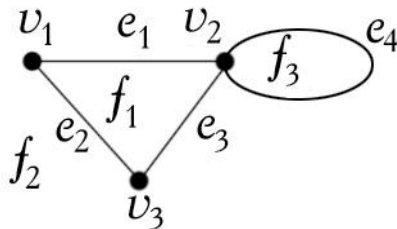
$$F = \{f_1, f_2\}.$$

$$n = |V| = 3, \quad m = |E| = 3, \quad f = |F| = 2.$$

$$n + f = 3 + 2 = 5 \quad m + 2 = 3 + 2 = 5.$$

4. , , .

$$V = \{v_1, v_2, v_3\}, \quad E = \{e_1, e_2, e_3, e_4\}, \quad F = \{f_1, f_2, f_3\}.$$



$$n = |V| = 3, \quad m = |E| = 4, \quad f = |F| = 3.$$

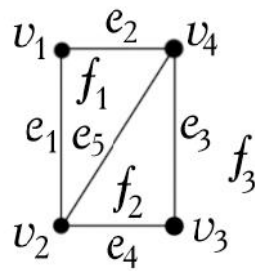
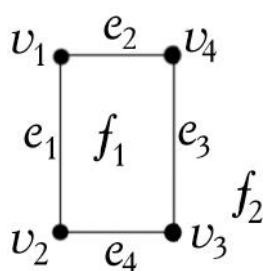
,

$$n + f = 3 + 3 = 6, \quad m + 2 = 4 + 2 = 6.$$

5.

$$V = \{v_1, v_2, v_3, v_4\}, \quad E = \{e_1, e_2, e_3, e_4\} \quad F = \{f_1, f_2\}$$

$$V = \{v_1, v_2, v_3, v_4\}, \quad E = \{e_1, e_2, e_3, e_4, e_5\} \quad F = \{f_1, f_2, f_3\}$$



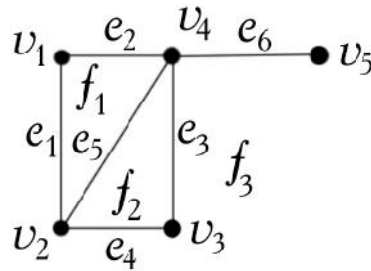
$$n=4, m=5, f=3.$$

$$n+f=4+3=7, m+2=5+2=7.$$

6.

$$V = \{v_1, v_2, v_3, v_4\}, E = \{e_1, e_2, e_3, e_4, e_5\} F = \{f_1, f_2, f_3\}$$

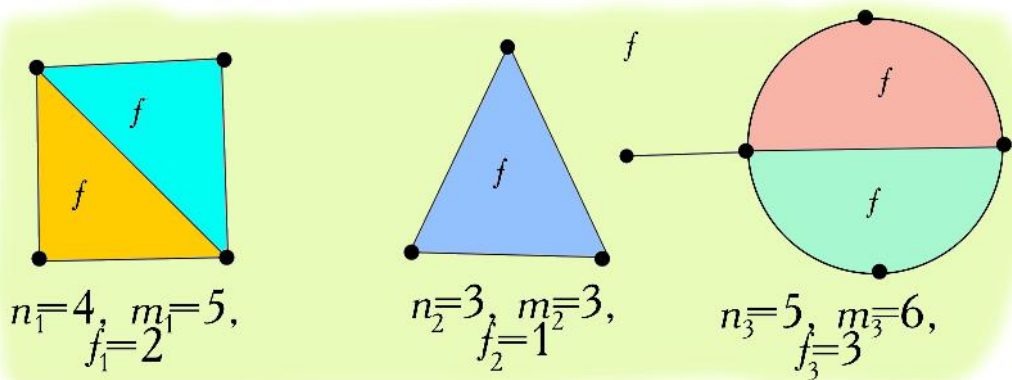
$$V = \{v_1, v_2, v_3, v_4, v_5\}, E = \{e_1, e_2, e_3, e_4, e_5, e_6\} F = \{f_1, f_2, f_3\}$$



$$n+f=5+3=8, m+2=6+2=8.$$

. G - n , m , f k
;

$$n+f=m+k+1.$$



$$n=n_1+n_2+n_3=4+3+5=12$$

$$m=m_1+m_2+m_3=5+3+6=14$$

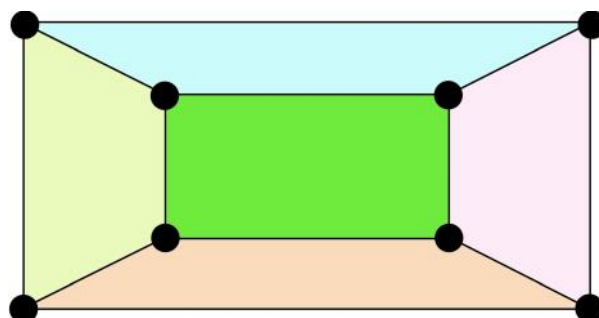
$$f=f_1+f_2+f_3=2+1+3=6$$

$$n+f=12+6=18$$

$$m+k+1=14+3+1=18$$

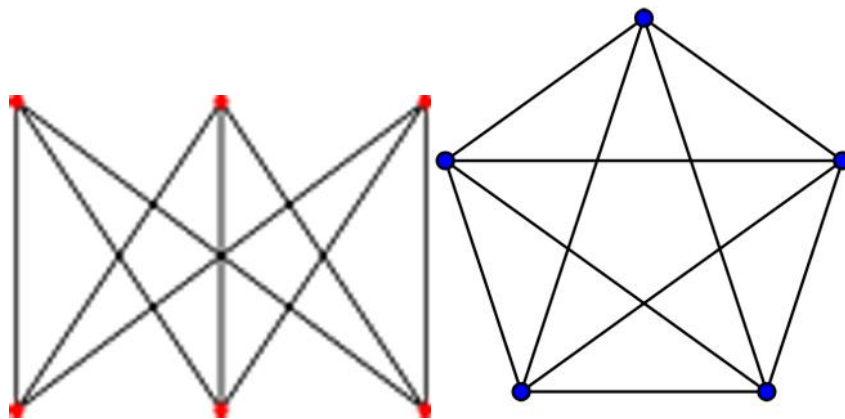
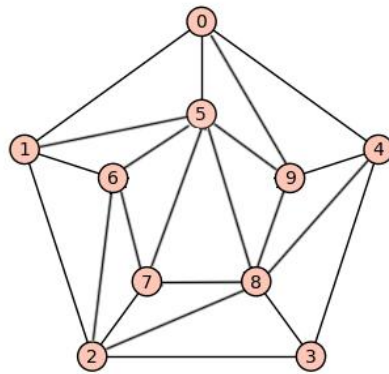
. G - m $n \geq 3$,

$$m \leq 3n - 6.$$



$$n=8>3 \quad m=12$$

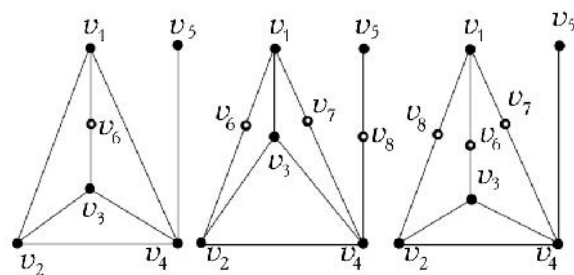
$$m<3n-6, \quad m<3\cdot 8-6, \quad m<24-6, \quad 12<18$$



$$K_5 \quad K_{3,3} -$$

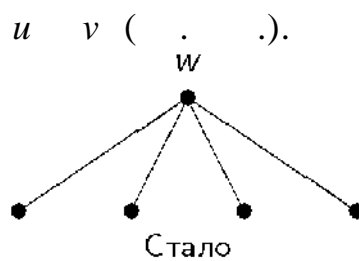
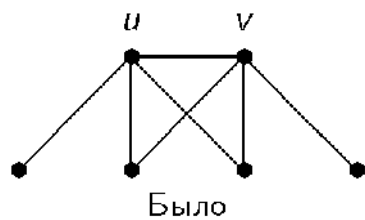
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K_5 $K_{3,3}$.
 2 —
 K_5 $K_{3,3}$.

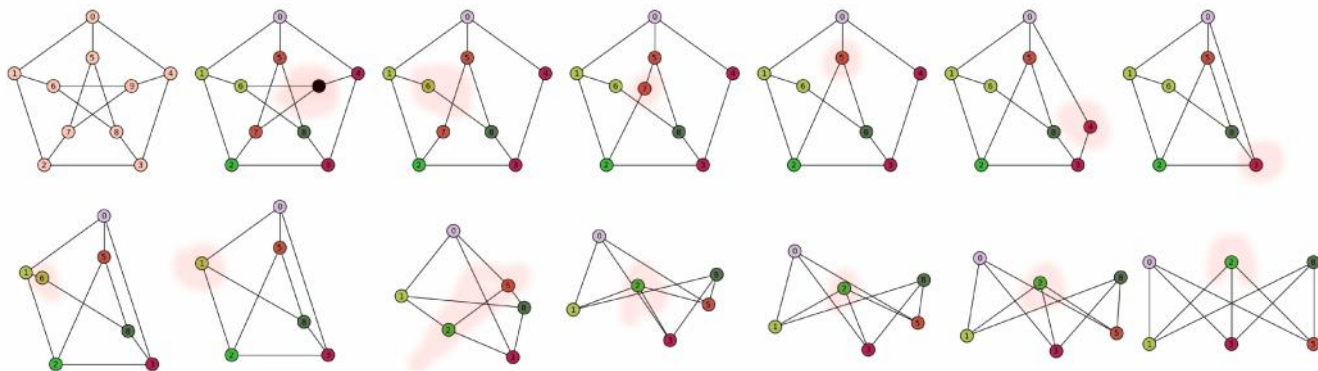
(u, v) — G . G u v .
 G w



G' . G' G
 (u, v) .
 (G', G) G' .

K_5 $K_{3,3}$.
 K_5 , $K_{3,3}$.

$K_{3,3}$



K_5

