Graphenalgorithmen
Blatt 8

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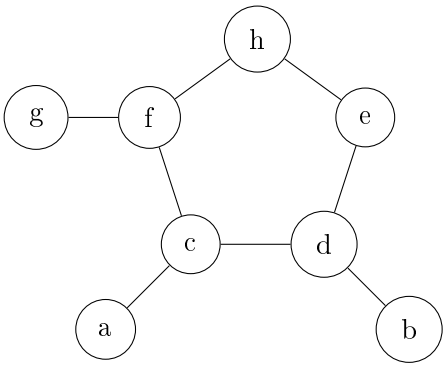
1 Aufgabe 1: Separator im Graphen G (10 Punkte)

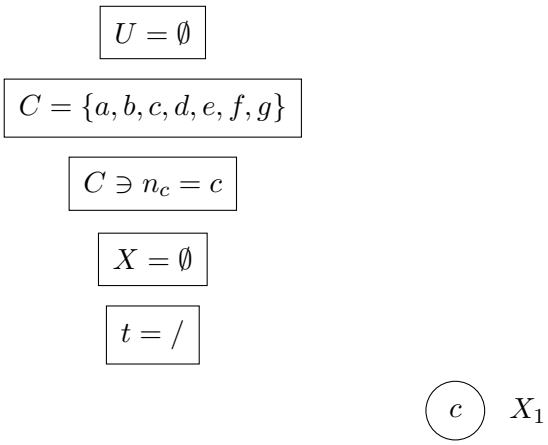
2 Aufgabe 2: Cops and Robber (10 Punkte)

3 Aufgabe 3: Baumzerlegung berechnen (20 Punkte)

3.1 a

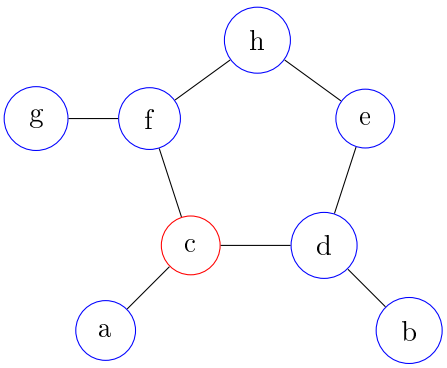


(a) Graph G

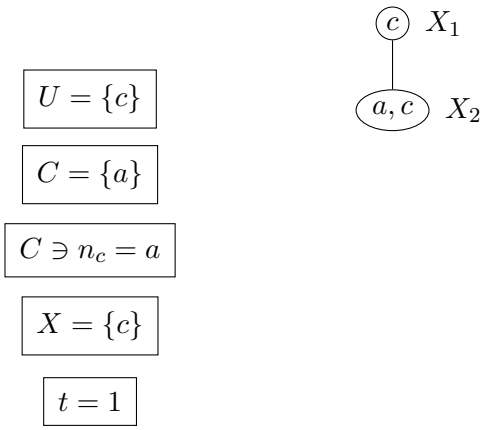


(b) Tree decomposition T

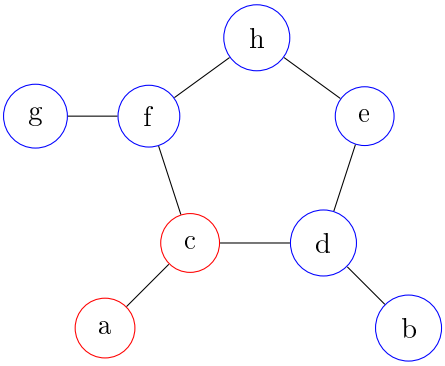
Abbildung 1: Ausgangssituation



(a) $V \setminus U \mid U$



(b) Tree decomposition T



(a) $V \setminus U \mid U$

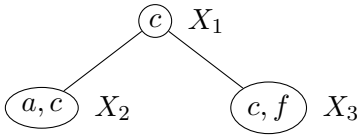
$U = \{a, c\}$

$C = \{b, d, e, f, g, h\}$

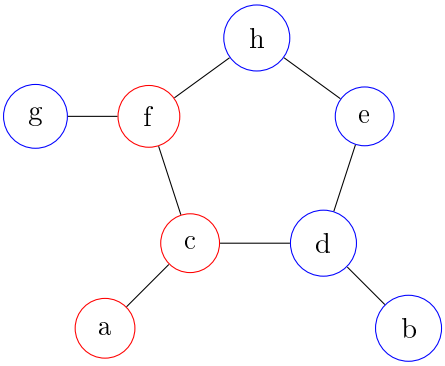
$C \ni n_c = f$

$X = \{c\}$

$t = 1$



(b) Tree decomposition T



(a) $V \setminus U \mid U$

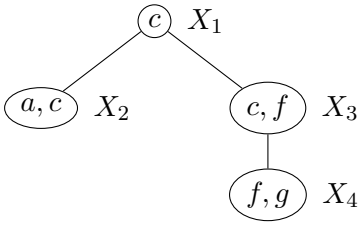
$U = \{a, c, f\}$

$C = \{g\}$

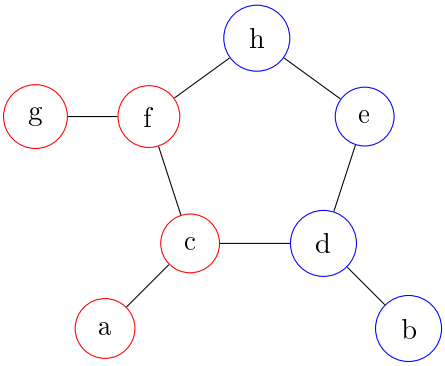
$C \ni n_c = g$

$X = \{f\}$

$t = 3$



(b) Tree decomposition T



(a) $V \setminus U \mid U$

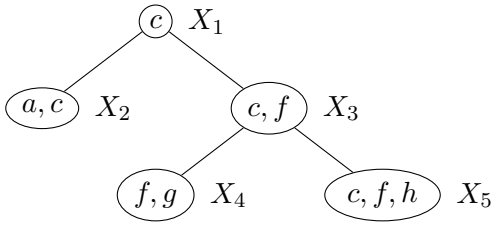
$U = \{a, c, f, g\}$

$C = \{b, d, e, h\}$

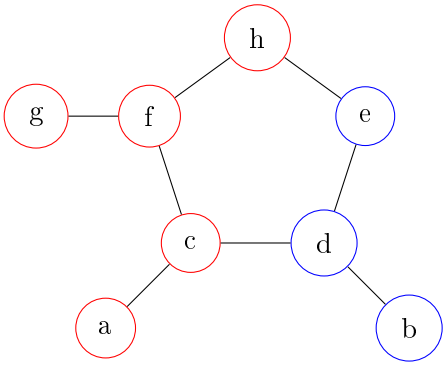
$C \ni n_c = h$

$X = \{c, f\}$

$t = 3$



(b) Tree decomposition T



(a) $V \setminus U \mid U$

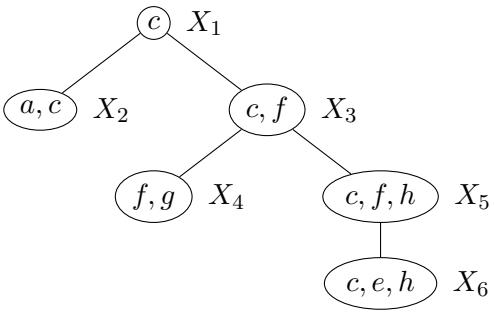
$U = \{a, c, f, g, h\}$

$C = \{b, d, e\}$

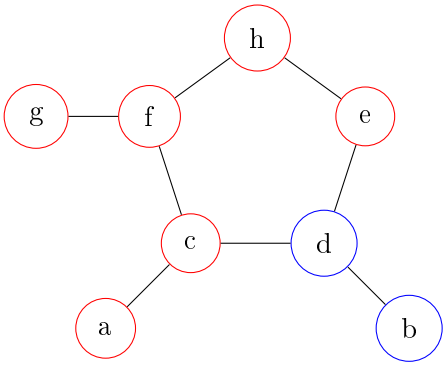
$C \ni n_c = e$

$X = \{c, h\}$

$t = 5$



(b) Tree decomposition T



(a) $V \setminus U \mid U$

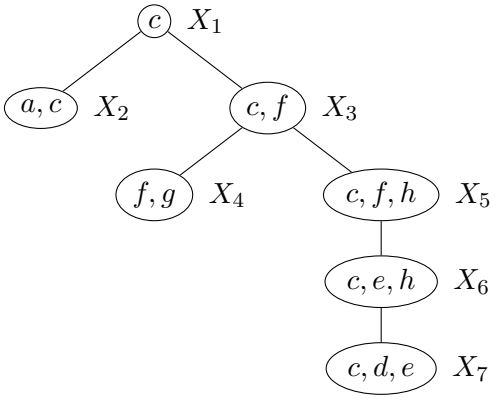
$U = \{a, c, e, f, g, h\}$

$C = \{b, d\}$

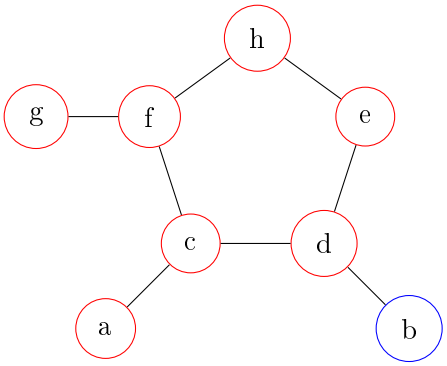
$C \ni n_c = d$

$X = \{c, e\}$

$t = 6$



(b) Tree decomposition T



(a) $V \setminus U \mid U$

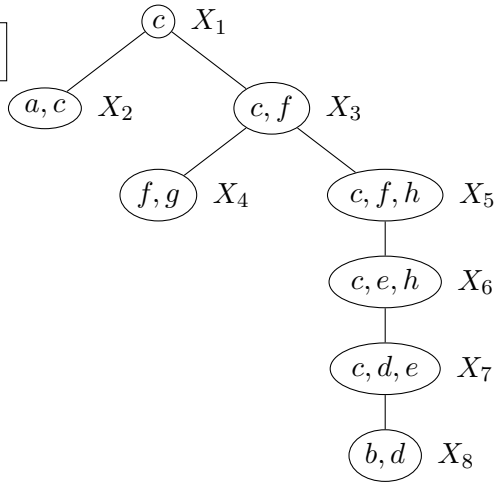
$U = \{a, c, d, e, f, g, h\}$

$C = \{b\}$

$C \ni n_c = b$

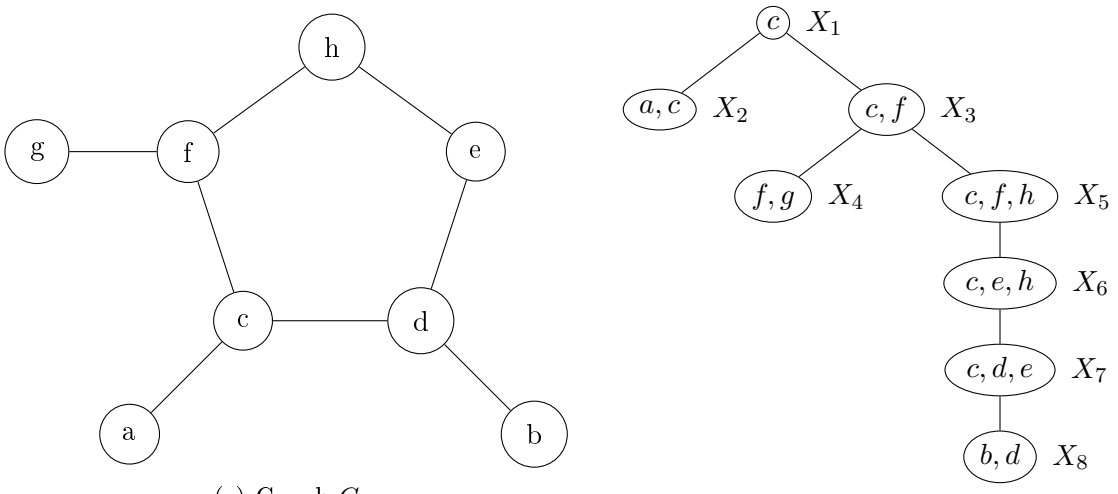
$X = \{d\}$

$t = 7$



(b) Tree decomposition T

step	0	1	2	3	4	5	6	7	Result
U	$\emptyset$	$\{c\}$	$\{a, c\}$	$\{a, c, f\}$	$\{a, c, f, g\}$	$\{a, c, f, g, h\}$	$\{a, c, e, f, g, h\}$	$\{a, c, d, e, f, g, h\}$	V
C	V	$\{a\}$	$\{b, d, e, f, g, h\}$	$\{g\}$	$\{b, d, e, h\}$	$\{b, d, e\}$	$\{b, d\}$	$\{b\}$	$\emptyset$
$C \ni n_C$	c	a	f	g	h	e	d	b	/
X	$\emptyset$	$\{c\}$	$\{c\}$	$\{f\}$	$\{c, f\}$	$\{c, h\}$	$\{c, e\}$	$\{d\}$	$\emptyset$
t	/	1	1	3	3	5	6	7	/

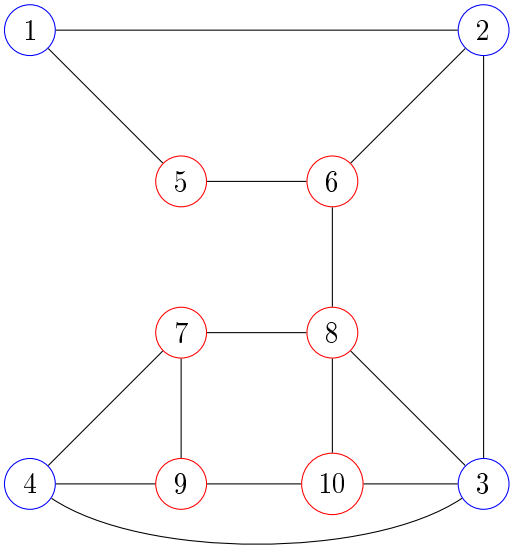


(a) Graph G

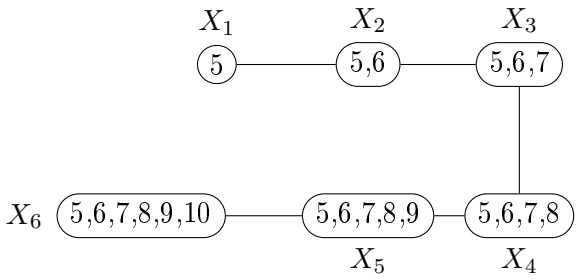
(b) Tree decomposition T

Abbildung 9: Result

3.2 b



(a) $U = X = \{5, 6, 7, 8, 9, 10\}$

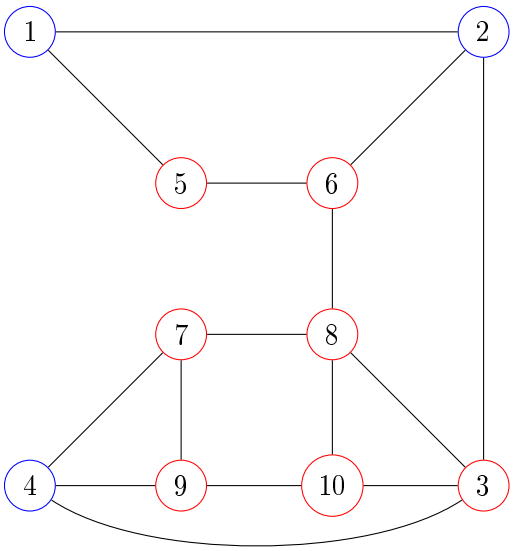


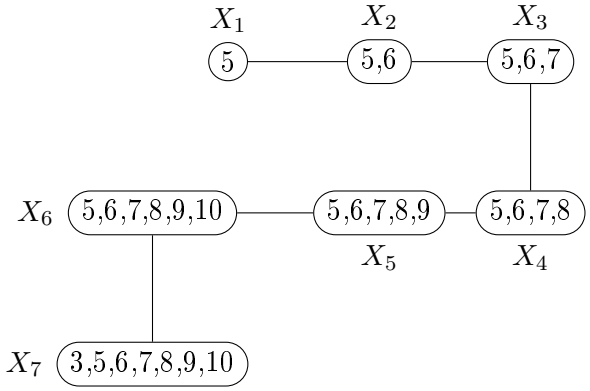
(b) $C = \{1, 2, 3, 4\}$

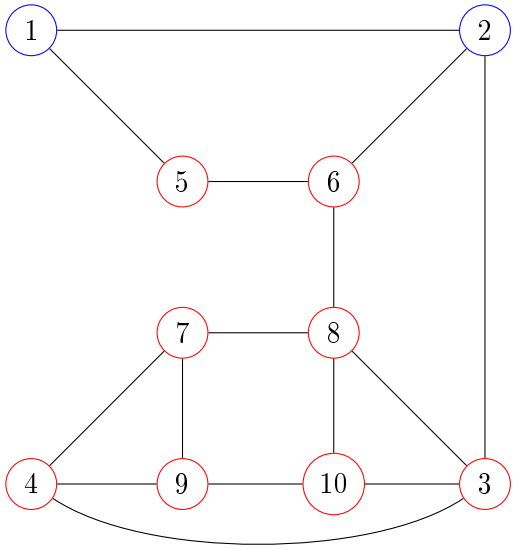
$X = \{5, 6, 7, 8, 9, 10\}$ ist nicht $w + 1 = 3$ verbunden, da $Y = \{7, 9, 10\}$ und $Z = \{5, 6, 8\}$ durch $S = \{8, 3\}$ separierbar ist. Weiter gilt:

$$\begin{array}{ccccccc} |S| & < & |Y| & = & |Z| & \leq & w+1 \\ 2 & < & 3 & = & 3 & \leq & 3 \end{array}$$

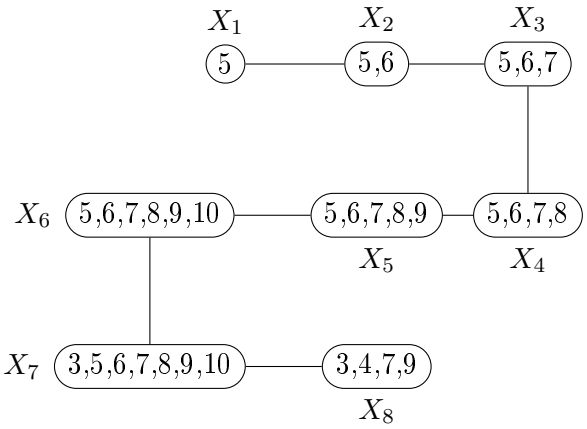
$S' = S \cap (Y \cup Z \cup C) = \{3, 8\}$ und somit $X_7 = X \cup S' = \{3, 5, 6, 7, 8, 9, 10\}$



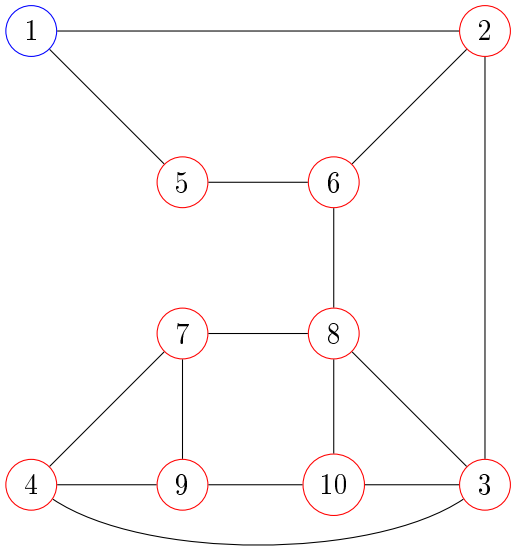




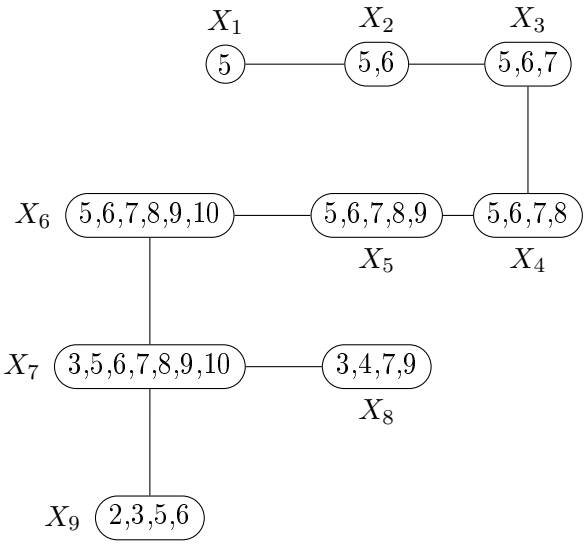
(a) $U = \{3, 5, 6, 7, 8, 9, 10\},\ X = \{3, 7, 9\}$



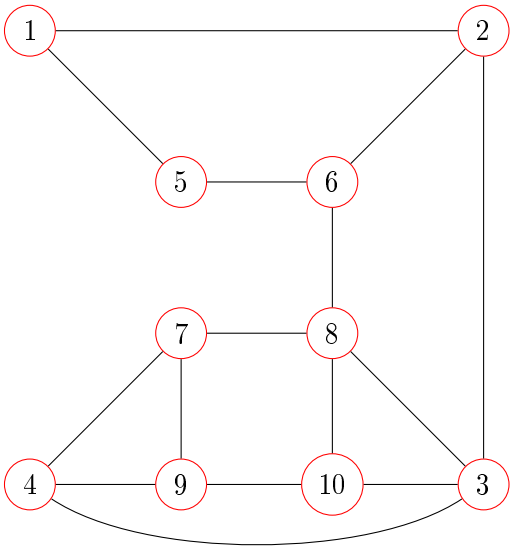
(b) $C = \{4\}$



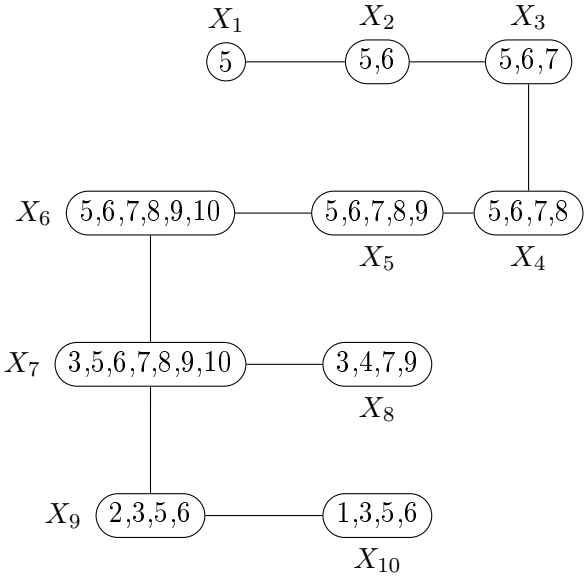
(a) $U = \{3, 4, 5, 6, 7, 8, 9, 10\},\ X = \{3, 5, 6\}$



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



(a) $U = \{2, 3, 4, 5, 6, 7, 8, 9, 10\},\ X = \{2, 5\}$



(b) $C = \{1\}$

step	...	7	8	9	10
U		$\{5, 6, 7, 8, 9, 10\}$	$\{3, 5, 6, 7, 8, 9, 10\}$	$\{3, 4, 5, 6, 7, 8, 9, 10\}$	$\{2, 3, 4, 5, 6, 7, 8, 9, 10\}$
C		$\{1, 2, 3, 4\}$	$\{4\}$	$\{1, 2\}$	$\{1\}$
$C \ni n_C$		/	4	2	1
X		$\{5, 6, 7, 8, 9, 10\}$	$\{3, 7, 9\}$	$\{3, 5, 6\}$	$\{2, 5\}$
t		6	7	7	9
Y		$\{7, 9, 10\}$	/	/	/
Z		$\{5, 6, 8\}$	/	/	/
S		$\{3, 8\}$	/	/	/