582 2014-02-04

Note Title 2014-02-04

HW2 correction

2.4 (Fig. 2.18)

every (non-inst.) variable is d-connected to A.

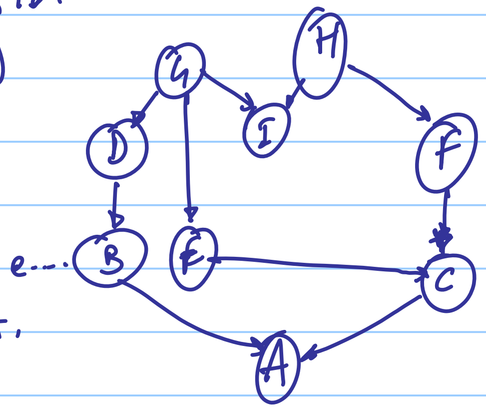
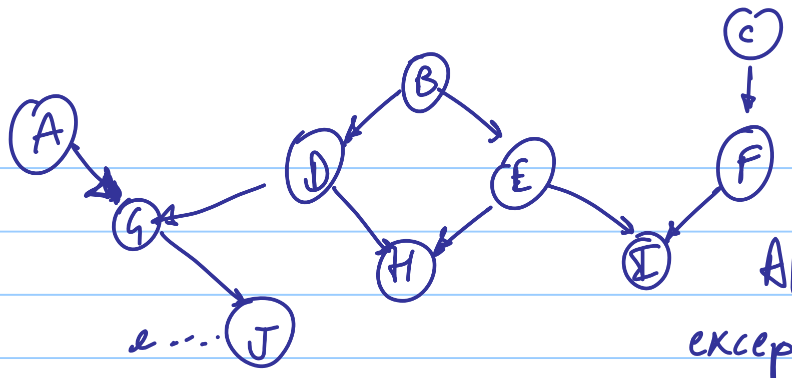


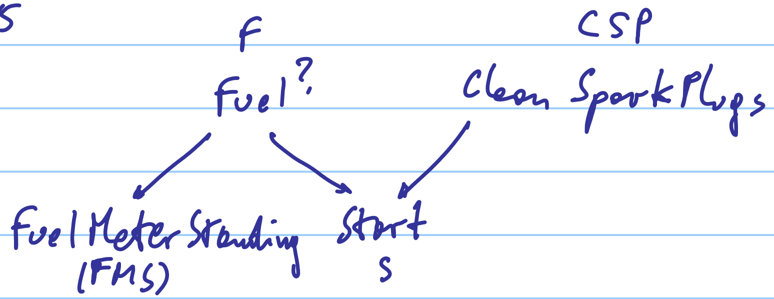
Fig.
2.19



All variables
except C, F
are d-connected
to A

Ex. 2.5

Fig. 2.1



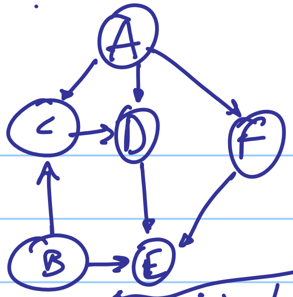
FMS and F, F and S, S and CSP cannot be d-separated

FMS and S can be d-separated by: $\{F\}, \{F, CSP\}$

FMS and CSP " " " ": $\{\}, \{F\}, \{F, S\}$

F and CSP " " " ": $\{\}, \{FMS\}$

Exercise 2.6



C & E (minimal)

$C \leftarrow A \rightarrow f \rightarrow E$	$\{A, F\}$
$C \leftarrow A \rightarrow D \rightarrow E$	$\{A, D\}$
$C \rightarrow D \rightarrow E$	$\{D\}$
$C \leftarrow B \rightarrow E$	$\{B\}$

minimal hitting sets of these are the minimal d-separating sets : $\{A, D, B\}$, $\{F, D, B\}$

A & B (minimal)

$A \rightarrow C \leftarrow B$, $A \rightarrow C \rightarrow D \rightarrow E \leftarrow B$, $A \rightarrow D \rightarrow E \leftarrow B$, $A \rightarrow D \leftarrow C \leftarrow B$
$A \rightarrow F \rightarrow E \leftarrow B$, $A \rightarrow F \rightarrow E \leftarrow D \leftarrow C \leftarrow B$. All path,

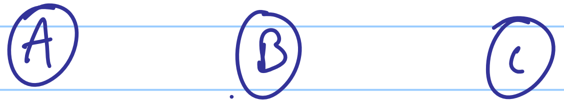
between A & B have (at least) on converging connection, so {} d-separates A & B

C & E (maximal) : {A, B, D, F}

A & B (maximal) : {F}

Exercise 2.9

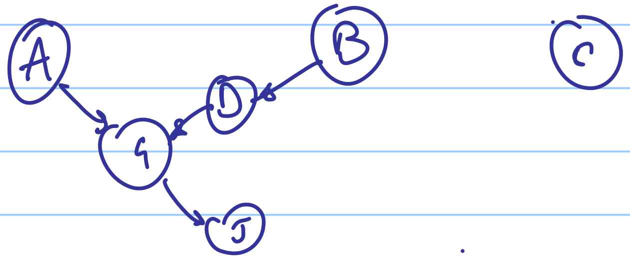
The graph induced by the ancestral graph on A, B, C from the graph of Fig. 2.19 is :



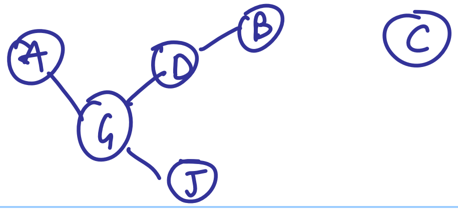
The moralized version of this graph is unchanged

In this graph, A is separated from C given B.
So, B d-separates A from C in the original gr h.

Other question: is A d-separated from C given B and J ({B, J}).



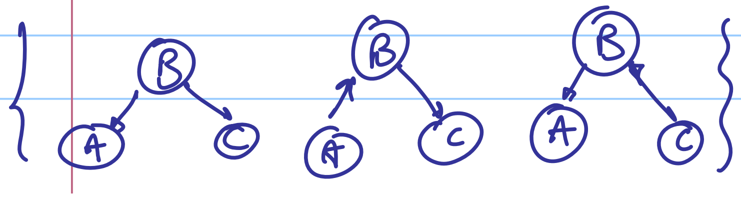
Moralize & get

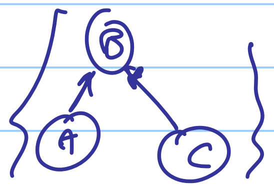


In this graph, A is separated from C.

So, it is still the case that A and C are d-separated given B and J.

Exercise 2.10





2 I-equivalent classes

$A \perp\!\!\!\perp C \mid \{B\}$

$A \perp\!\!\!\perp C \,(\mid \{\})$

(Important for Learning)

Exercise 1.13

$P(A, B, C)$

	b_1	b_2
a_1	(0.006, 0.054)	(0.048, 0.432)
a_2	(0.014, 0.126)	(0.032, 0.288)

$P(B, C) =$

	b_1	b_2
c_1	0.02	0.08
c_2	0.18	0.72

$P(B) = \left(\underset{b_1}{0.2}, \underset{b_2}{0.8} \right)$

$$P(A|B,C) \quad \begin{array}{c|cc} & b_1 & b_2 \\ \hline a_1 & (0.3, 0.3) & (0.6, 0.6) \\ a_2 & (0.7, 0.7) & (0.4, 0.4) \end{array}$$

Yes!

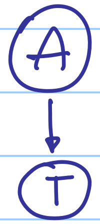
A and C are independent given B

- is $P(A=a_1 | B=b_1, C=c_1)$ = (shorthand) =

$$P(a_1 | b_1, c_1) = \frac{P(a_1, b_1, c_1)}{P(b_1, c_1)} = \frac{0.006}{0.02} = 0.3$$

In general, $P(a_i | b_j, c_k) = \dfrac{P(a_i, b_j, c_k)}{P(b_j, c_k)}$

Homework: Ex. 1.7 [J07], Ex 1.12 [J07]



$P(A) = (.2, .8)$

	A=yes	A=no
T=yes	0.99	0.001
T=no	0.01	0.999