Question 5] BN

b] Given x_1 is missing

we can just take all possible values

of x_1 ie $i \neq \in d$

so time complexity $= O(nd)$

Space complexity $= O(n)$

(since we sum out d & store
only the remaining values
i-e dataset

c] x_1, x_2, x_3, x_4 is missing

$P(x_1) = f(x_1)$

$P(x_2 | x_1) = f(x_1, x_2)$

$P(x_3 | x_2) = f(x_2, x_3)$

$P(x_4 | x_1) = f(x_1, x_4)$

$P(x_5 | x_2, x_4) = f(x_2, x_4)$ (since x_5 is given)

$P(x_6 | x_3, x_5) = f(x_3)$

$P(x_7 | x_4) = f(x_4)$

$P(x_8) \cdots$ constant
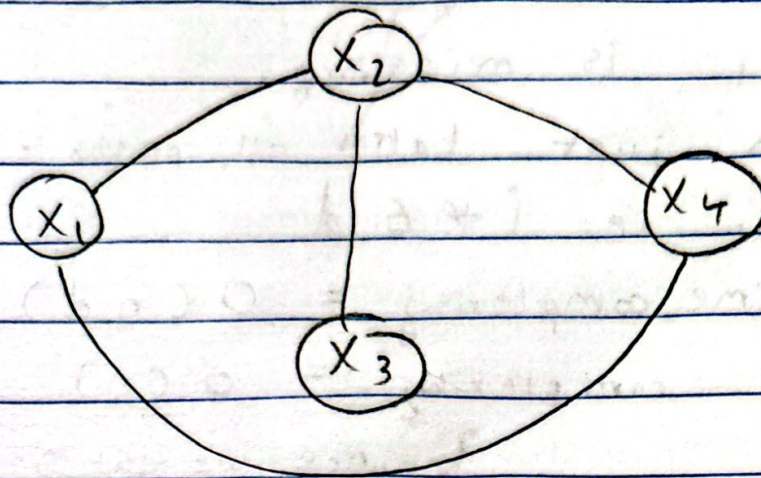
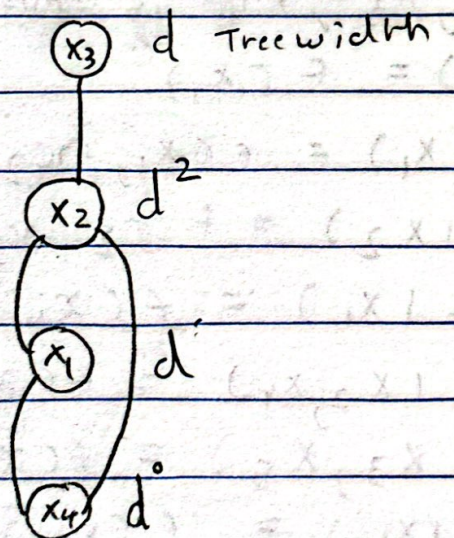$P(x_9 | \cdots$ constant

for each
row in dataset
of size
n.

Joint probability,

$\Rightarrow f(x_1) f(x_1, x_2) f(x_2, x_3) f(x_1, x_4)$
$f(x_2, x_4) f(x_3) f(x_4)$

Primal Graph,

Elimination order

X_3 d Treewidth

X_2 d^2

X_1 d'

X_4 d^0

Tree width $= 2$

Time complexing $= O(nd^3)$ (n cuz n dataset points.

Space complexing $= O(nd^2)$