Fall 2019
Final
Question 4

Spring 2018
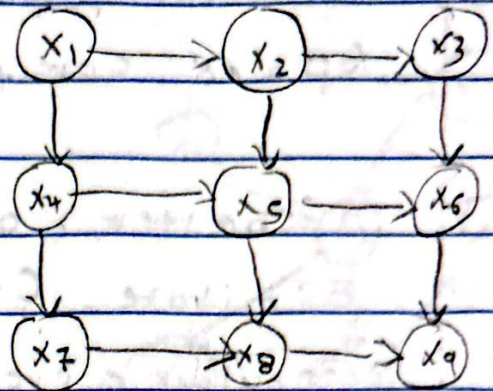Final
Question 5
Part a)

Spring 2017
Final
Question 5
a)

Question 4] /5]

$$P(x_1) = f(x_1)$$

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

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

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

$$P(x_5 | x_2, x_4) = f(x_5, x_2, x_4)$$

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

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

$$P(x_8 | x_7, x_5) = f(x_8, x_7, x_8)$$

$$P(x_9 | x_6, x_8) = f \cdots = \text{constant}$$

Eliminate x_1

$$\sum_{x_1} f(x_1) f(x_1, x_2) f(x_4, x_1)$$

$$\Rightarrow g(x_2, x_4) - ①$$

Eliminate x_2

$$\sum_{x_2} f(x_2, x_3) f(x_5, x_2, x_4) g(x_2, x_4)$$

$$= g'(x_3, x_4, x_5) - ②$$

$$\sum_{x_3} g'(x_3, x_4, x_5) f(x_6, x_5, x_3)$$

$$= g''(x_4, x_5, x_6) - ③$$

Eliminate x_4

$$\sum_{x_4} g''(x_4, x_5, x_6) f(x_4, x_7)$$

$$= g'''(x_5, x_6, x_7) - ④$$

Eliminate x_5

$$\sum_{x_5} g'''(x_5, x_6, x_7) f(x_5, x_7, x_8) = h(x_6, x_7, x_8) -$$

Eliminate X_6

$$\Rightarrow \sum_{x_6} h(x_6, x_7, x_8) = h'(x_7, x_8) -$$

Eliminate X_7

$$\Rightarrow \sum_{x_7} h'(x_7, x_8) = h''(x_8)$$

Eliminate $X_8 \rightarrow$ done

Time complexity $= O(d^4)$ (skp ②,③,④)
Space complexity $= O(3d^3)$