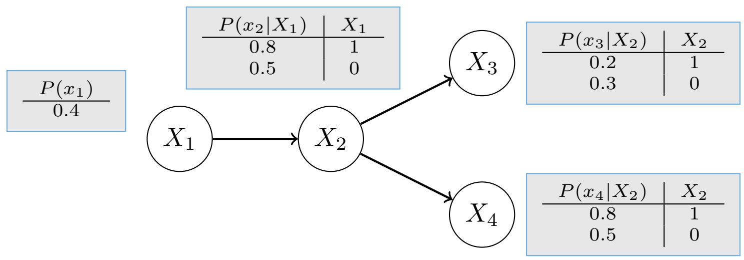
Question 1.

Consider the network below and compute

a) the marginal probability $P(X_3 = 0) = P(\neg x_3)$,

b) the conditional probability $P(X_2 = 1 \mid X_3 = 1) = P(x_2 \mid x_3)$.



Question 2.

Consider the same network as above.

Assume that the sequence $\{r_i\}_{i=1}^{20}$ was generated at random uniformly from the interval $(0; 1)$. Use the sequence to

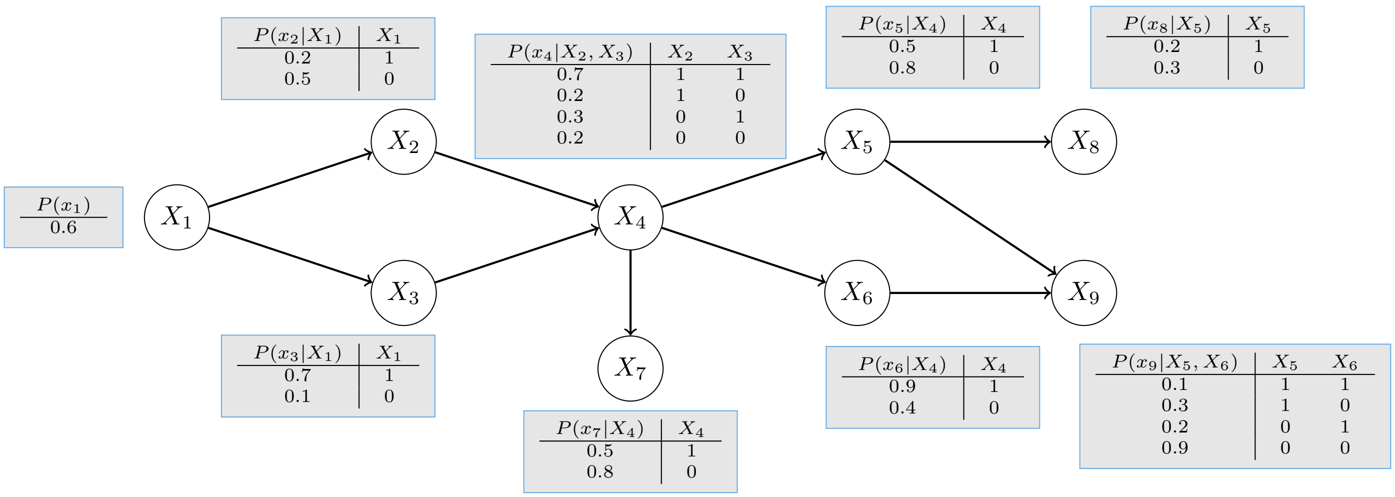
a) approximate $P(x_3)$ using a suitable sampling method,

b) approximate $P(x_1 \mid x_2, \neg x_3)$ using *rejection sampling* and *likelihood weighting*.

r_1	r_2	r_3	r_4	r_5	r_6	r_7	r_8	r_9	r_{10}
0.2551	0.5060	0.6991	0.8909	0.9593	0.5472	0.1386	0.1493	0.1975	0.8407
r_{11}	r_{12}	r_{13}	r_{14}	r_{15}	r_{16}	r_{17}	r_{18}	r_{19}	r_{20}
0.0827	0.9060	0.7612	0.1423	0.5888	0.6330	0.5030	0.8003	0.0155	0.6917

Question 3.

Consider the Bayes net below:



$P(x_1)$
0.6

$P(x_2 \mid X_1)$	X_1
0.2	1
0.5	0

$P(x_3 \mid X_1)$	X_1
0.7	1
0.1	0

$P(x_4 \mid X_2, X_3)$	X_2	X_3
0.7	1	1
0.2	1	0
0.3	0	1
0.2	0	0

$P(x_7 \mid X_4)$	X_4
0.5	1
0.8	0

$P(x_5 \mid X_4)$	X_4
0.5	1
0.8	0

$P(x_6 \mid X_4)$	X_4
0.9	1
0.4	0

$P(x_8 \mid X_5)$	X_5
0.2	1
0.3	0

$P(x_9 \mid X_5, X_6)$	X_5	X_6
0.1	1	1
0.3	1	0
0.2	0	1
0.9	0	0

a) Compute the marginal probability distribution $P(X_7)$ using *variable elimination* with the elimination order

$$X_1, X_8, X_9, X_5, X_6, X_2, X_3, X_4.$$

b) Compute $P(x_8 \mid \neg x_4)$ however you see fit.