1 Variable Elimination

Using the same Bayes Net (shown below), we want to compute $P(Y \mid +z)$. All variables have binary domains. Assume we run variable elimination to compute the answer to this query, with the following variable elimination ordering: $X, T, U, V, W$.

![Bayes Net Diagram]

Complete the following description of the factors generated in this process:

After inserting evidence, we have the following factors to start out with:

$$P(T), P(U\mid T), P(V\mid T), P(W\mid T), P(X\mid T), P(Y\mid V, W), P(+z\mid X)$$

(a) When eliminating $X$ we generate a new factor $f_1$ as follows, which leaves us with the factors:

$$f_1(+z\mid T) = \sum_x P(x\mid T)P(+z\mid x) \quad P(T), P(U\mid T), P(V\mid T), P(W\mid T), P(Y\mid V, W), f_1(+z\mid T)$$

(b) When eliminating $T$ we generate a new factor $f_2$ as follows, which leaves us with the factors:

(c) When eliminating $U$ we generate a new factor $f_3$ as follows, which leaves us with the factors:
When eliminating $V$ we generate a new factor $f_4$ as follows, which leaves us with the factors:

When eliminating $W$ we generate a new factor $f_5$ as follows, which leaves us with the factors:

How would you obtain $P(Y \mid +z)$ from the factors left above:

What is the size of the largest factor that gets generated during the above process?

Does there exist a better elimination ordering (one which generates smaller largest factors)?