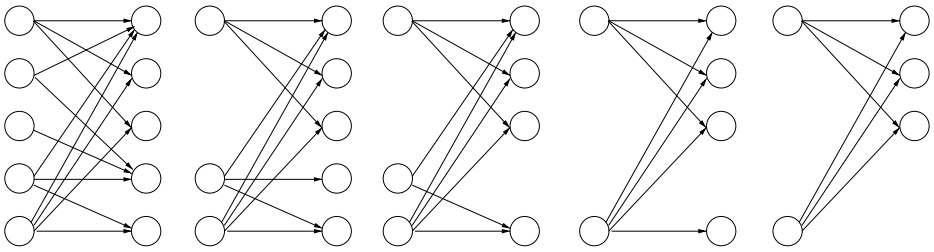
Problem Set 5

Problem 1. Perform the steps of iterative pruning to find (2,3) cores on the following graph.

Answer. The iterations are as follows:



Problem 2. Adapt the a priori algorithm to enumerating bipartite cores.

Answer. After all pruning steps are done, we can apply *a priori* to enumerate the remaining bipartite cores. Note that every subset of an (i, j) core is itself an (i', j') core, with $i' \leq i, j' \leq j$. For each j, initialize S to $(1, j)$ cores (i.e., all fans with $outdegree \geq j$ and their neighbors. Now to enumerate $(2, j)$ cores, note that only those fans identified in S need to be considered when checking pairs of fans that point to j nodes. Likewise, when looking for (i, j) cores, we need only consider fan subsets f of size i where each subset of f of size $i - 1$ was identified in the previous iteration and placed in S.

Problem 3. Referring to the Voting Algorithm slide (lecture 11, slide 34), what does the matrix AA^TA represent?

Answer. If A has dimensions $u \times d$, then AA^TA is also a $u \times d$ matrix, whose i'th row is a vector whose k'th entry gives a vote count to doc k wrt user i.