HW 6: due Tues, November 15

- Find the maximum weight matching in a complete bipartite graph with the following adjacency matrix (rows represent vertices in X, columns vertices in Y), using the primal/dual algorithm to output both the matching and a proof that it is max weight.

$$\begin{vmatrix} 7 & 8 & 9 & 1 & 6 \\ 8 & 2 & 1 & 5 & 7 \\ 9 & 1 & 0 & 3 & 2 \\ 4 & 5 & 9 & 5 & 8 \\ 6 & 5 & 2 & 8 & 4 \end{vmatrix}$$

- The *bottleneck matching problem* is the following: given a graph $G = (V, E)$, and a *weight* $w : E \rightarrow Z^+$, find a perfect matching M such that $\max_{e \in M} w(e)$ is as small as possible. Give a polynomial time algorithm for bottleneck matching.

- The *bin packing* problem is the following: We are given n objects of size $\{c_1, \ldots, c_n\}$ and another integer B – the *bin capacity* and we are asked to find an assignment of these objects to bins such that the sum of all the sizes of the objects in each bin does not exceed B, and there are *as few bins as possible.* Show that in the special case that the sizes ALL satisfy $c_j > B/3$, then bin-packing can be reformulated as a matching problem. Then solve it in a much easier way.