**18.085 Computational Science and Engineering** March 20,2010

# Answers to Problem Set 5 #

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[2.7-4]
$A$ has 8 rows and 8 columns with the first column $[1/\sqrt{2}, 0, -1/\sqrt{2}, 0, 0, 0, 0, 0]^T$. $A^T w = 0$ has a nonzero solution since the columns of $A$ are linearly dependent.

[2.7-5]
There are 8 bars and 10 displacements, and thus 2 independent solutions. Then since $A$ is not of full rank, it is not positive definite, and thus it is semidefinite.

[2.7-8]
There are 6 bars and 8 unknowns, which is not stable. If we add one diagonal crossbar, it is still unstable. Then if we add a second crossbar, there are 8 bars and 8 unknowns, which will be stable.

[2.7-9]
Let $A_0$ be $[\cos\theta, \sin\theta, -\cos\theta, -\sin\theta]$. $A_0^T y = f$ can be solved for any $f = cA_0^T$, which means the forces must be balanced at the two nodes.

[2.7-10]
Rotation around another point is a linear combination of the rotation about the origin and a horizontal or vertical translation.

For a space truss, the six rigid motions are translation or rotations about x,y,x axis

[2.7-13]
$u_{ij}$ should be $(K^{-1})_{ij}$, not just $1/K_{ij}$.