# MTH127: Homework 3

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1. Since the entry at $A_{ij}$ is the coefficient of $x_i$ in equation i, $A_{ij}$ returns 4 at $x_i$. This means that $A_{ij}$ can only return 4 when $i = j$. Also we can note here that this means the diagonal entries of A are 4. For the case when $A_{ij}$ returns -1 it is a bit more tricky. $A_{ij}$ returns -1 when $x_j$ is adjacent to $x_i$. The rest of the matrix A are 0 since we know nothing else matters for setting up the equation.

2. Using information from the first problem we know the coefficients are -1 when $x_j$ and $x_i$ are adjacent and vice versa. Also since the diagonal is filled with 4 since $A_{ij}$ returns 4 @ $i = j$ the matrix must be symmetrical.

3. I do not understand what semidefinite means.

4. If $k = 50$, 7500 variables; $size(A) = 7500^2$.

   (a) standard MB (with respect to computer memory) == 1048576 bytes $(1024^2, 2^{20})$. So we would use size(A) * 8 (bytes), this would yield 450000000 bytes; however consider the MB constraints so : $450000000/1024^2 = 429MB$

   (b) whos (at $k = 50$) returns : A 7500x7500 475204 double sparse

   (c) I dont know what density is.

   (d) cond_num = 3.0991e+03

   (e) relative_error = 6.8814e-13

5. Seems like the shape is a negation of some kind; it went from being convex to concave. I do not know what a Laplacian is.