MATH 520 PROBLEM SET 1
SPRING 2017
BROWN UNIVERSITY
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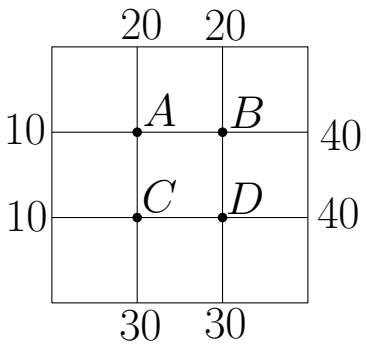
*This problem set is due at the end of the day on Wednesday, 1 February 2017. Please write up your solutions (**one problem per page**) clearly and legibly, scan them, and upload them using Gradescope (submission instructions on the course website). There are also MyMathLab problems due at the same time.*

1 (based on #32 in §1.1) Suppose that the temperature around the perimeter of the thin plate shown below is held fixed at the temperature values specified by the diagram (units are degrees Celsius). Suppose that the temperature at each interior node is equal to the average of the temperature at the four neighboring nodes.



(a) Write a system of equations satisfied by the four temperatures A, B, C, and D.

(b) Solve the system of equations from (a).

Fun follow-up fact: the same idea works with thousands of interior nodes instead of just four, and the resulting solution is a very good approximation of what actually happens physically. You can learn about how such physical problems can be solved by discretizing with a fine grid and solving large linear systems in a numerical differential equations course.

2 (based on #33 in §1.2) Find real numbers a_0, a_1, a_2 which satisfy the following: if p is a polynomial defined by

$$p(t) = a_0 + a_1 t + a_2 t^2,$$

then we have $p(1) = 12$, $p(2) = 15$, and $p(3) = 16$.