

## Below, I have reproduced one of the grader's comments about homework assignment #4.

Overall, questions 2 and 3 were not much of a problem; I graded holistically as you asked, rather than in a detailed manner. If students got problem 2 or 3 circled, it's because they used equation 6.165 to solve the problem (using the properties of orthogonal curvilinear coordinates). The problem with this was that I felt this method failed to show how the respective forms were derived from the Laplacian operator, as you asked. What they ended up doing was a whole different problem, which didn't have to do directly with the Laplacian operator, but because they did the steps correctly they still received some partial credit.

The biggest problem came in number 1, where many of the students ended by giving the answer  $y = x^{\text{stuff}}$ , or else without considering the three cases (i.e. the three possible values of the discriminant). The problem is that  $y = x^{\text{stuff}}$  is not the entire solution; in fact it is not even the general solution. It is a solution, but in the case of a double root, we have to find the second solution, which is not accounted for when we simply say  $y = x^{\text{stuff}}$ . Again, rather than write this out on everyone's paper, I circled problem 1 (i.e. I didn't circle the entire problem, just the number "1" on their paper) if this pertained to them.

Finally, a general comment: some students used a math program to assist in solving problems 2 and 3, which was great overall. However their answer ended up consisting of something along the lines of: "Using Mathematica we get the values of  $u(x)$ ,  $u(y)$ , and  $u(z)$ ; we then use Mathematica again to find  $u(x)^2$ ,  $u(y)^2$ , and  $u(z)^2$ , add them up, and that's our answer." This doesn't adequately demonstrate that the students actually did anything other than outline the procedure. In the least they ought to write down the values of each of these quantities to show they did the steps. Showing work overall has gotten much better; I'm mostly interested in the thought process, but I still have to see proof that the homework was actually done.