

MAE231B Homework #6

Date: 3/4/2008

Due: 3/11/2008

Problem 1

(a) Use the complex variable representation of the bi-harmonic equation to show that the most general solution can be expressed in terms of two arbitrary harmonic functions, $u_1(x_1, x_2)$ and $u_2(x_1, x_2)$, as follows:

$$U(x_1, x_2) = (x_1^2 + x_2^2) u_1(x_1, x_2) + u_2(x_1, x_2)$$

Hint: Use Equation (21.1.16b) and set $\varphi(z) = z \phi_1(z)$, where $\phi_1(z)$ is another analytic function.

(b) Use the solution (21.1.16b) of the bi-harmonic equation, and by direct calculation verify the results listed in Table 21.1.1, page 728 of the text.