Needham, Chapter 5, Exercise 3, p. 258.
G. Palmer, December 21, 2015

3. Use the previous exercise (not calculation) to show that each of the following is "harmonic".

(i) $e^x \cos y$

Assuming x and y are real, this is a real function, so it is only the real part of f, corresponding to u in f = u + iv. Then by the results of exercise 2, it is harmonic. Note also that u is a real and v = 0, so the second derivatives of both are zero, and $0^2 + 0^2 = 0$.

(ii) $e^{(x^2-y^2)} \cos 2xy$

Same answer as (i).

(iii) ln|f(z)|, where f(z) is analytic

ln|f(z)| is a real function, so the answer to (i) also applies here.