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.